WATER WORKS & SEWERAGE

● Perchloron is performing a big service for our armed forces in every fighting zone and in camps here and over there. Perchloron is helping keep camp laundries, kitchens, shower rooms and footbaths sanitary, and is safeguarding the Army and Navy's water supply.

Limited quantities of Perchloron are available again for civilian use. Let Perchloron safeguard your water supply. Your Penn Salt representative will gladly give you advice and cooperation without obligation. Write today for free Perchloron booklet.

PENNSYLVANIA SALT
MANUFACTURING COMPANY
Chemicals

1000 WIDENER BUILDING, PHILADELPHIA 7, PA.

New York • Chicago • St. Louis • Pittsburgh • Cincinnati • Minneapolis • Wyandotte • Tacoma

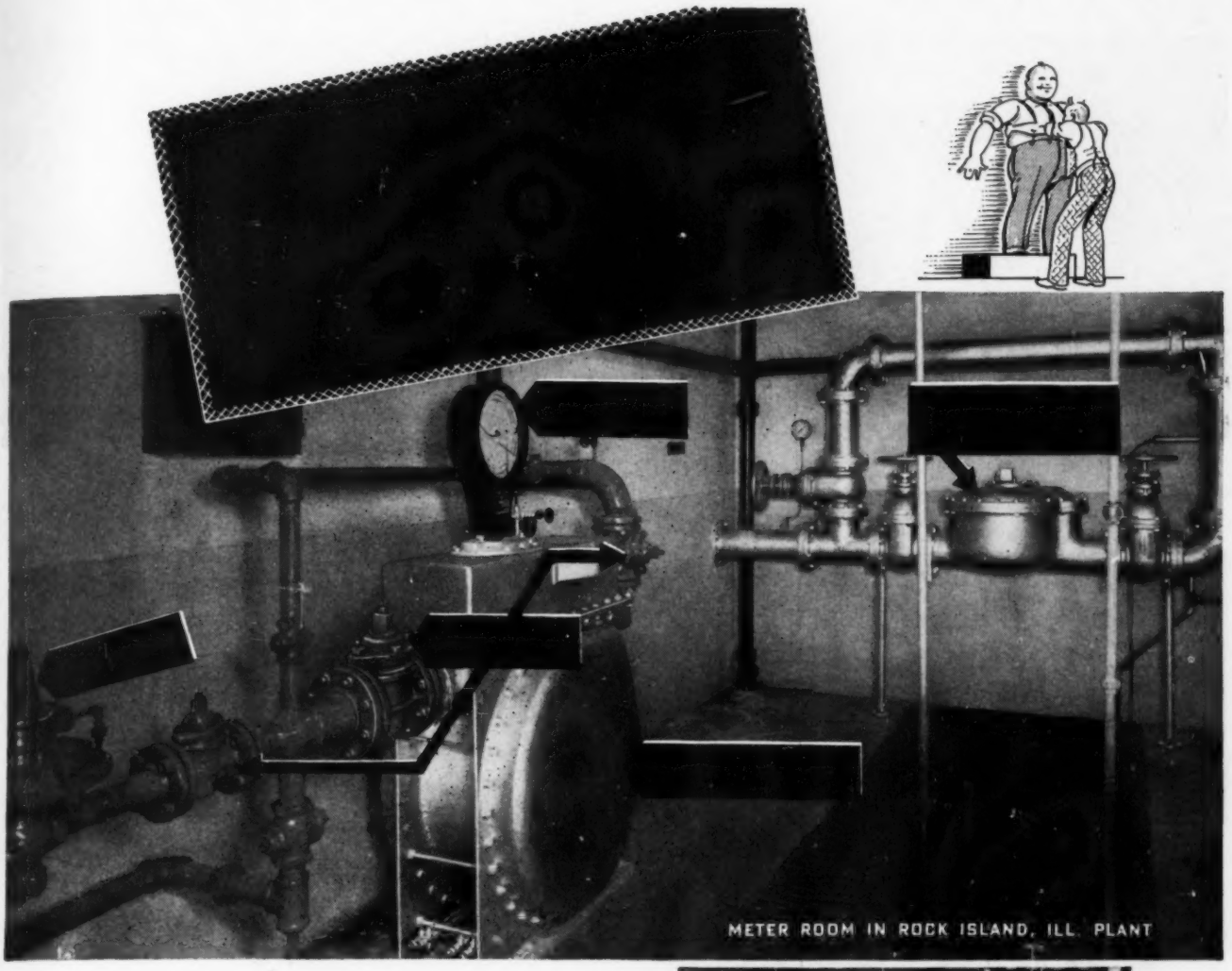
Penn Salt Manufactures

LIQUID CHLORINE
for water sanitation
and sewage treatment

Also

Anhydrous Ammonia • Filter Alum • Ferric Chloride • Sodium Aluminate • Chloride of Lime • Caustic Soda and other products

WATER WORKS & SEWERAGE, January, 1945. Volume 92, Number 1. Published monthly by Gillette Publishing Co., 330 South Wells Street, Chicago, Ill. Per copy, 25c. Subscription rate, United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as Second Class Matter, June 2, 1931, at the Post Office at Chicago, Ill., under act of March 3, 1879.



METER ROOM IN ROCK ISLAND, ILL. PLANT

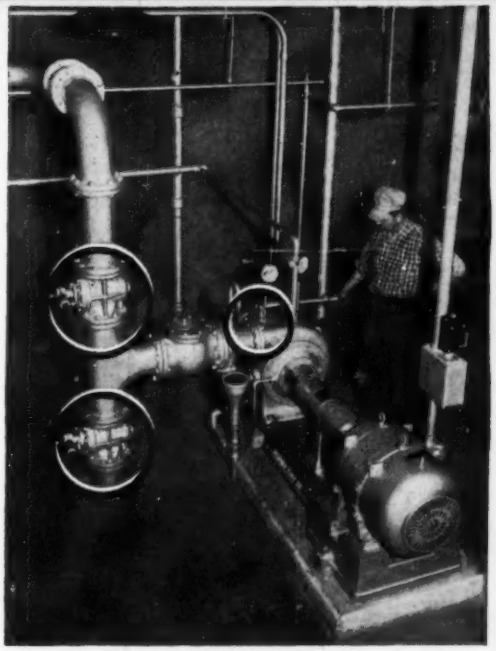
FIT THE METERS AND VALVES TO THE SERVICE

Measurement and control go hand-in-hand in sewage disposal plants. It takes specialized equipment to control the diversity of services that are encountered in this field. Pittsburgh Equitable Meter Company and subsidiary, Merco Nordstrom Valve Company, have the necessary meters, regulators, and valves properly engineered for the installations involved and in a complete range of sizes, types, and working pressures for every requirement.

In the anticipated post-war sewage treatment construction boom, it would be well to remember that for the best results sanitation engineers, in the past, have specified Nordstrom Lubricated Valves, EMCO Sludge Gas Meters and Regulators, and Pittsburgh-Empire Hot and Cold Water Meters.

PITTSBURGH EQUITABLE METER CO.

Atlanta Houston **MERCO NORDSTROM VALVE CO.** Los Angeles Boston
Brooklyn Pittsburgh Main Offices, PITTSBURGH, PA. Seattle Chicago
Kansas City Tulsa San Francisco New York
National Meter Division, Brooklyn, N. Y.



NORDSTROM VALVES
ON CENTRIFUGAL SLUDGE PUMP
MINNEAPOLIS-ST. PAUL PLANT

SERVING SMALLER SEWAGE PLANTS

BUILDERS

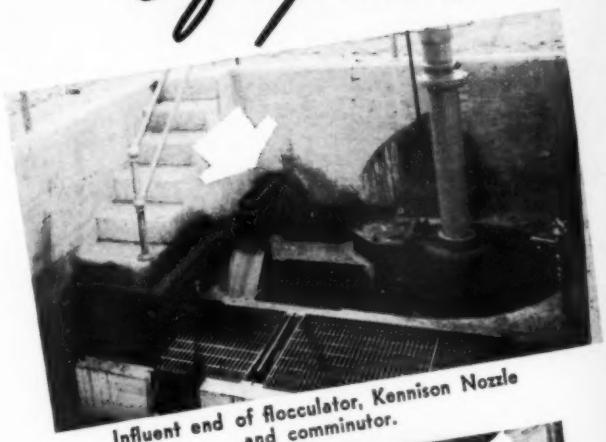
WATER AND SEWAGE WORKS *Equipment*

For the smaller sewage plant as well as the large, BUILDERS Instruments are the choice of experienced engineers. It seems natural that BUILDERS Flow Meters and Controllers should have been selected for the attractive new plant of the Belgrave Sewer District at Great Neck, Long Island.

A 16" Kennison Nozzle with Chronoflo Electric Transmitter, two miles away, and Receiver Instrument at the plant, measure all sewage arriving from a neighboring war plant. Another 16" Kennison Nozzle meters the total incoming sewage from the entire area. The two Chronoflo Receivers continuously indicate and record the rate of sewage flow and show the total gallons. As an added and highly important function, the second Chronoflo automatically controls the amount of chemical added in exact proportion to the flow of sewage. Thomas M. Riddick, consulting engineer, and H. O. Johnson, superintendent, have reason to be proud of the high efficiency maintained in the reduction processes of this modern sewage plant.

For bulletins describing Builders Equipment in detail, address Builders-Providence, Inc. (division of Builders Iron Foundry), 9 Codding St., Providence 1, R. I.

"'BLUE PRINT NOW"



Influent end of flocculator, Kennison Nozzle and comminutor.

Chronoflo Transmitter and dry chemical proportioning feeder.

Sincerely Yours,

BUILDERS-PROVIDENCE

Another Military Camp

turns to ELEVATED STORAGE

. . . for an adequate water supply for fire protection and general service

AN eastern Army air field recently erected the 250,000-gal. Horton radial-cone bottom elevated tank shown at the left to provide a gravity supply of water for both fire protection and for general service.

It is only natural that the engineers responsible for water supply and service at today's training camps should turn to elevated storage, for these same engineers have seen this type of water storage efficiently solve the basic water supply problems in municipalities. Uniform distribution pressures, provision for pumping during off-peak periods, together with adequate reserve available for fire protection, are advantages mutually beneficial to both training camp and municipalities.

•

We have been designing, fabricating and erecting elevated water storage tanks for more than 50 years. In addition to radial-cone bottom tanks like the one shown, which may be built in large capacities with a small range in head, we also fabricate ellipsoidal-bottom tanks and Waterspheres (spherical tanks supported on a cylindrical column).

Complete information and estimating data on Horton elevated tanks to meet your requirements is available upon request. Address our nearest office.

CHICAGO BRIDGE & IRON COMPANY

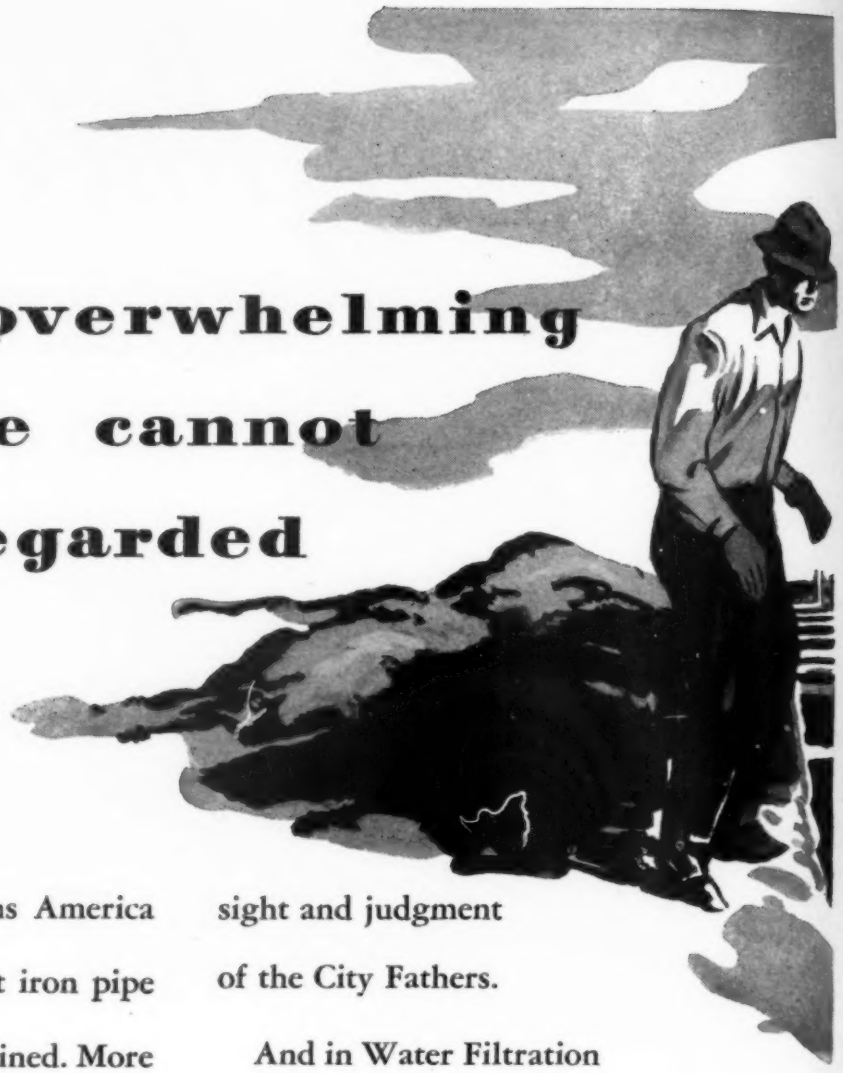
Chicago 4.....2198 McCormick Bldg.
New York 6.....3390-165 Broadway Bldg.
Cleveland 15.....2262 Guildhall Bldg.
Los Angeles.....1455 Wm. Fox Bldg.
Birmingham 1.....1586 North 50th Street

Plants in Birmingham, Chicago and Greenville, Pa.

Tulsa 3.....1646 Hunt Bldg.
Houston 1.....5615 Clinton Drive
Philadelphia 3.....1644-1700 Walnut Street Bldg.
Washington 4.....703 Atlantic Bldg.
San Francisco 5.....1083 Rialto Bldg.

In Canada: Horton Steel Works, Limited, Fort Erie, Ont.

Such overwhelming evidence cannot be disregarded



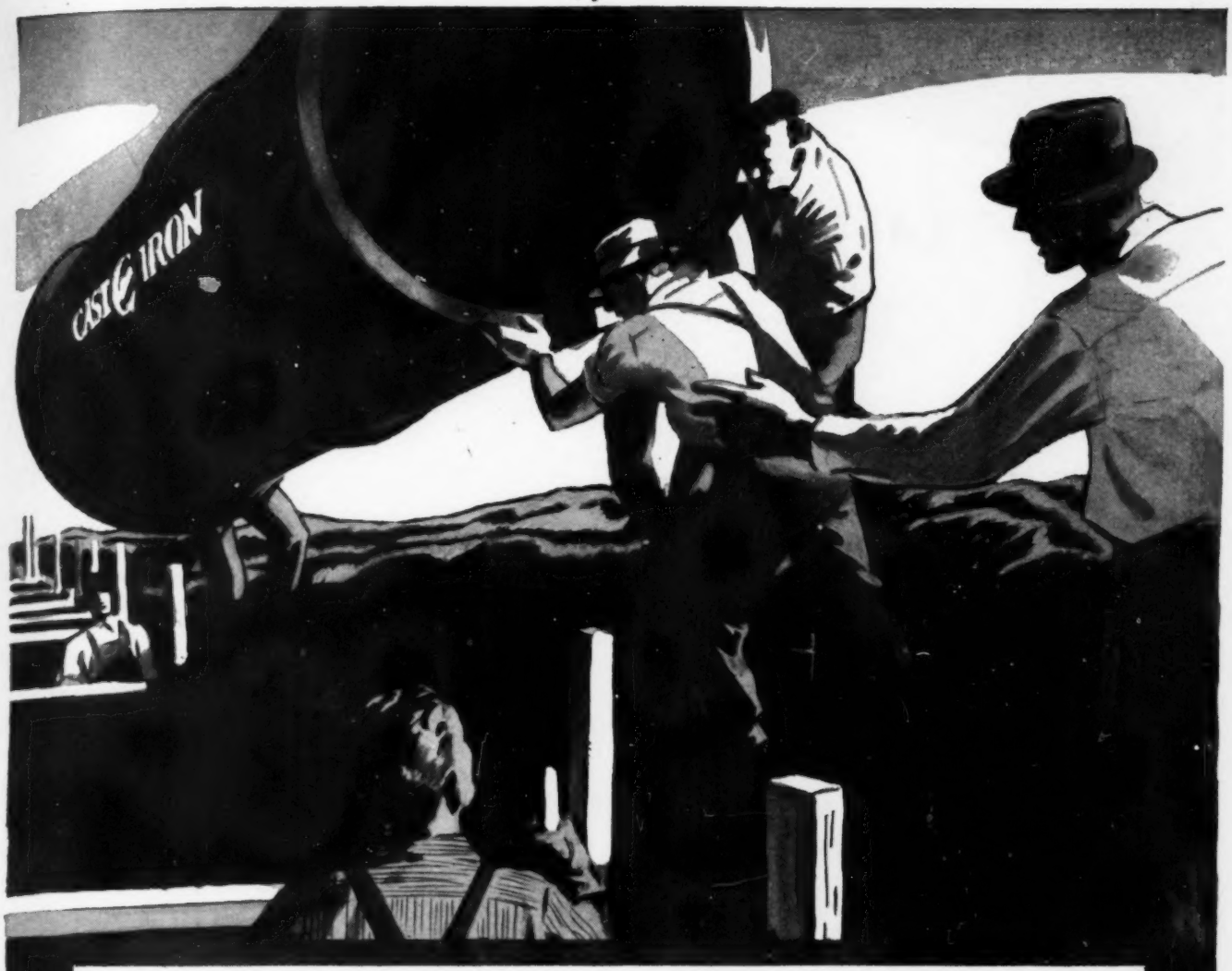
FOR water distribution mains America buys several times more cast iron pipe than all other kinds of pipe combined. More than 95 per cent of the pipe in the water distribution systems of America's fifteen largest cities is cast iron pipe.

Philadelphia, the first city in America to buy cast iron pipe 123 years ago, is 98% cast iron; New York is 97%; Chicago, 99%. Philadelphia's first cast iron main, laid in 1822, is still serving in testimony to the foresight and judgment of the City Fathers.

And in Water Filtration Plants and Sewage Treatment Plants throughout America, more than 95% of all the pipe used is cast iron pipe.

For further evidence of the overwhelming majority vote for cast iron pipe, send for booklet, "Facts About Cast Iron Pipe." Write to Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, Peoples Gas Bldg., Chicago 3, Ill.

Trust the pipe you know about



THE 10 REQUIREMENTS FOR UNDERGROUND MAINS

LONG LIFE: In evaluating bids, the useful life of cast iron pipe is figured at 100 years minimum.

FLOW CAPACITY: Under normal conditions, the flow capacity of cast iron pipe remains practically unimpaired for centuries. For the limited areas where active water is encountered, cement-lined cast iron pipe is available. Under such conditions, no other material offers the combined long life and sustained flow capacity of lined cast iron pipe.

TIGHT JOINTS: For ordinary pressures, cast iron bell-and-spigot pipe—for high pressures, cast iron mechanical joint pipe—have stood the test of time and are known to be leak-proof.

TENSILE STRENGTH: Routine specimens cut from standard cast iron pipe show tensile strength ranging from 23,000 to 30,000 pounds per square inch.

BEAM STRENGTH: Under beam stress tests, standard six-inch cast iron pipe bears up under a load of 17,500 pounds and deflects approximately 1½ inches before breaking.

TOUGHNESS: Under hydrostatic pressure and the impact of a 50 lb. hammer, ordinary cast iron pipe does not crack until the hammer is dropped four feet (beginning at one foot with one-foot increases.)

INTERNAL PRESSURE: An average of many internal hydrostatic pressure tests on standard six-inch cast iron pipe shows this pipe withstands more than 2500 pounds pressure per square inch.

EXTERNAL PRESSURE: In regulation compression tests on a 12-inch section, standard six-inch cast iron pipe withstands a crushing weight of 14,000 pounds.

IMPERVIOUSNESS: The walls of cast iron pipe are impervious to leakage, seepage or sweating of water, gas or chemicals under internal pressure tests.

TAPPING: Cast iron pipe can be tapped cleanly with strong, tough threads, losing little in structural strength.

Other pipe materials meet some of these requirements but only cast iron pipe meets them all.

CAST IRON PIPE SERVES FOR CENTURIES

LAST-MINUTE STUFF?
No, not the Water and Sewage Works people! Most of our post-war projects are in blueprint form, now. Financing details have been arranged. Contracts are ready to let. Here is one group in America that can cheer the boys with a clear conscience when they come marching home. Jobs will be ready. If you are one of the few who still have some replacement projects or new construction to finish planning, get it done now. Let's have our group ready one hundred percent.

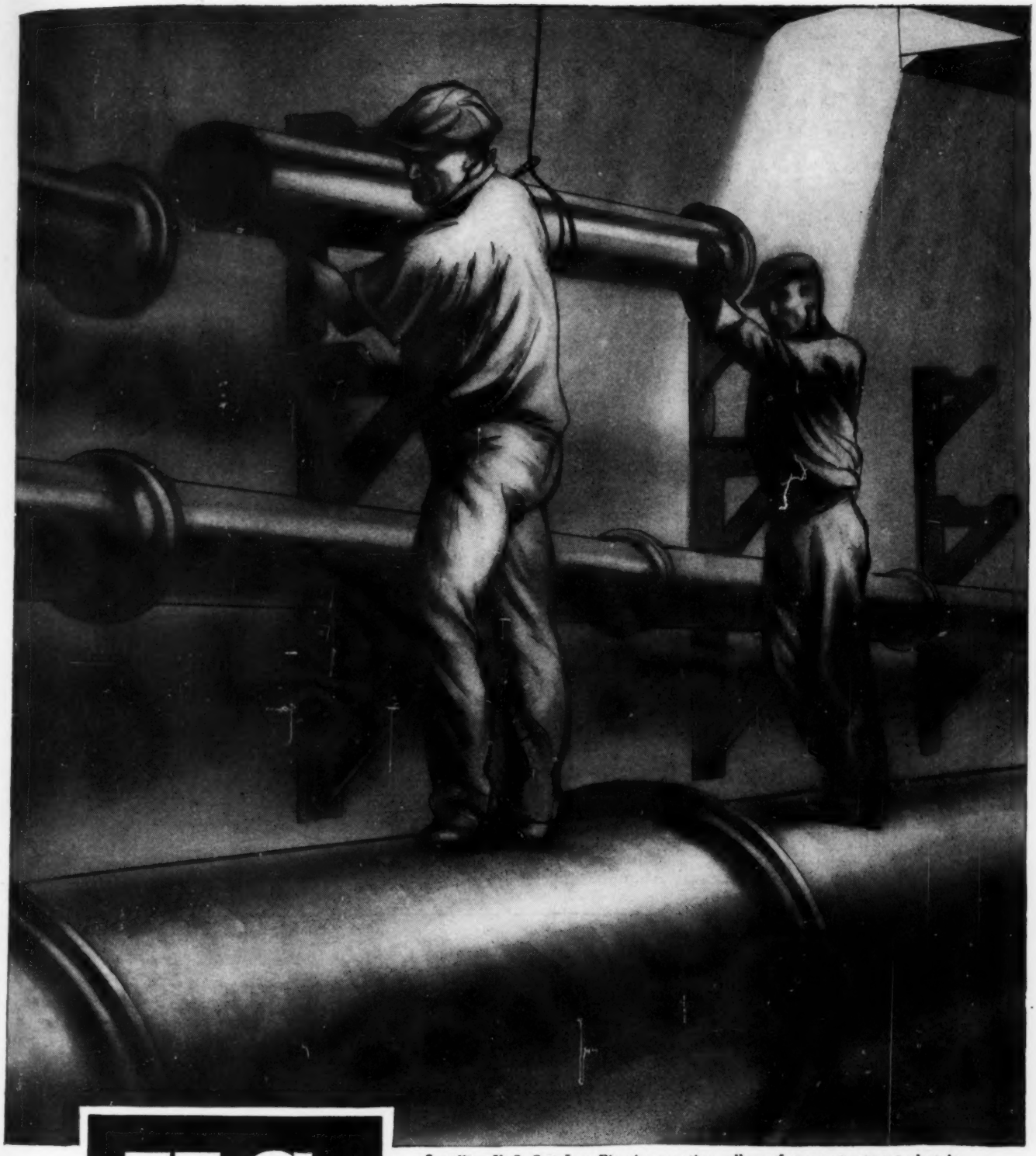
MATHEWS HYDRANTS

400 CHESTNUT STREET, PHILADELPHIA, PA.

ESTABLISHED IN 1803

Made by R.D. WOOD Company

MANUFACTURERS OF SAND SPUN PIPE (CENTRIFUGALLY CAST IN SAND MOLDS) AND R. D. WOOD GATE VALVES



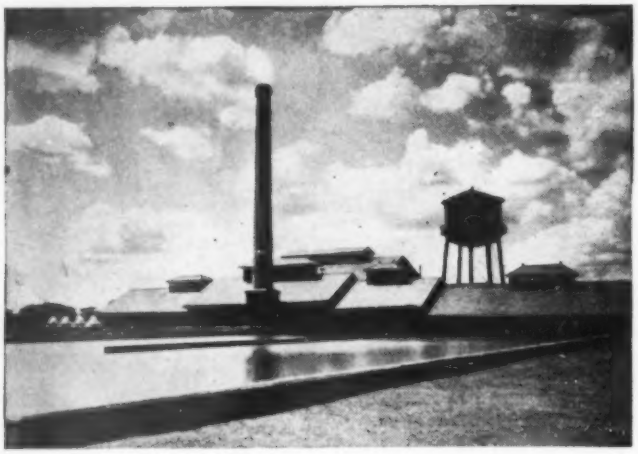
Installing U. S. Cast Iron Pipe in operating gallery of sewage treatment plant in New York City. Drawn by Rico Lebrun for U. S. Pipe and Foundry Co.

U.S. cast iron PIPE

U. S. PIPE & FOUNDRY CO.
General Offices: Burlington, N. J.
Plants and Sales Offices throughout the U. S. A.

More than 95 per cent of the pipe used for water distribution mains, filtration plants and sewage treatment plants in the United States is cast iron pipe. It is the recognized standard material for these services. As the largest producer of cast iron pipe for 45 years, we have acquired a wide knowledge of pipe design which may be found helpful in solving your current or postwar problems.

GENERAL CHEMICAL "ALUM"
. . . EQUALLY EFFICIENT FOR COAGULATION OF *WATER and SEWAGE!*



Today, aluminum sulfate is almost universally accepted by water experts as the best coagulant for the removal of turbidity, color and bacteria from water . . . and General Chemical Aluminum Sulfate is the outstanding choice the nation over. The reason? Operating men have come to rely on its high quality and constant uniformity, knowing that the effectiveness of General Chemical Alum has been "proved in settling basins all over America."

Municipal officials in charge of sewage disposal find that clarity and purity of sewage effluent are also easily obtainable with General Chemical Aluminum Sulfate because of the many reasons noted below. Why not join the majority of American cities that prefer General Chemical Alum—and specify "General" for your requirements?

★ FOR WATER WORKS

1. Produces crystal-clear water.
2. Gives better floc formation resulting in longer filter runs.
3. It is a low-cost coagulant.
4. Has no chlorine demand, conserving chlorine exclusively for disinfection.
5. Superior in tests against other coagulants.
6. High in quality, its constant uniformity can be counted upon.
7. Aids in the reduction of tastes and odors.

★ FOR SEWAGE PLANTS

1. Clean, easy to handle, dry feeds well, and economical to use.
2. Simple application, requires only low cost feeding apparatus and minimum attention.
3. Clear, colorless effluents are possible.
4. Sludge digests readily.
5. Treated digested sludge dries quickly, with a minimum of odor.
6. Chlorine consumption is cut due to lower demand of clarified sewage.

GENERAL CHEMICAL COMPANY

Basic Chemicals for Industrial America

"Preferred by Most American Cities"

GENERAL CHEMICAL COMPANY

40 RECTOR STREET, NEW YORK 6, N. Y.

Sales and Technical Service Offices: Atlanta • Baltimore • Boston • Bridgeport (Conn.) Buffalo • Charlotte (N. C.) • Chicago • Cleveland • Denver • Detroit • Houston Kansas City • Los Angeles • Milwaukee • Minneapolis • New York • Philadelphia Pittsburgh • Providence (R. I.) • San Francisco • Seattle • Utica (N. Y.) • Wenatchee Yakima (Wash.)

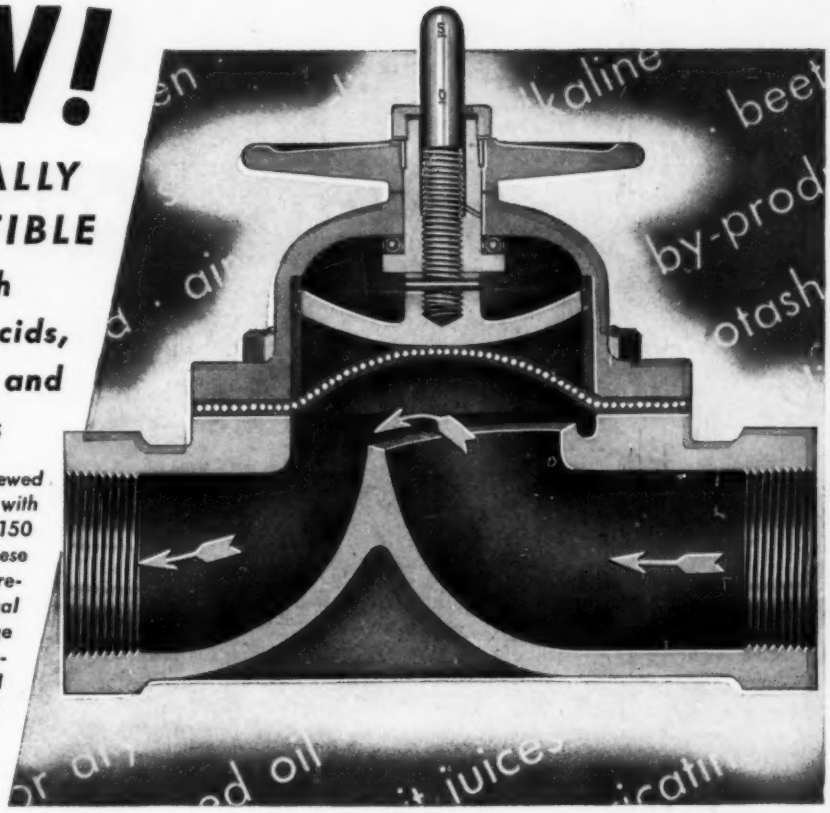
In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

NEW!

...PRACTICALLY INDESTRUCTIBLE

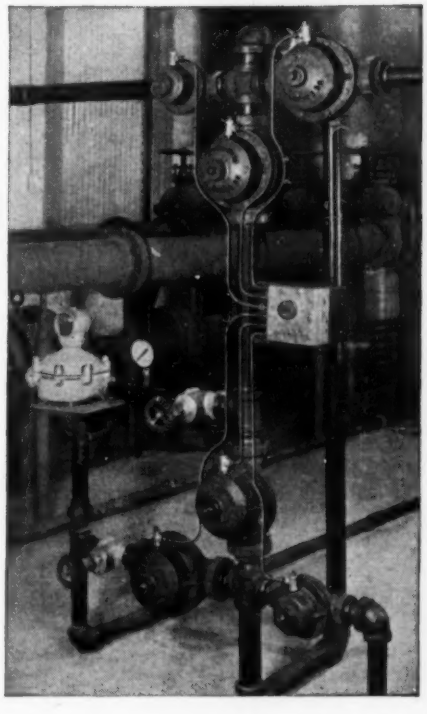
in Service with upwards of 100 Acids, Alkalies, Abrasives and Suspended Solids

Available in 10 sizes, ½" to 6", Screwed or Flanged. In semi-steel or lined with rubber, glass or lead. Pressures to 150 lbs. Temperatures to 150° F. These valves are being extensively used to replace more expensive valves in chemical plants, industrial plants, mines, sewage disposal plants, water works, paint factories, paper mills, food processing and other industries. Hand-operated type at right; below, pilot-operated type controlling flow rate, backwash and rinse cycles in Mid-West industrial plant.

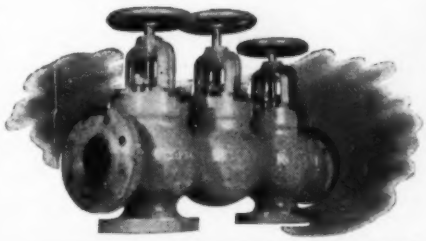


McALEAR

No. 1455 Corrosion and Abrasive Proof DIAPHRAGM VALVE



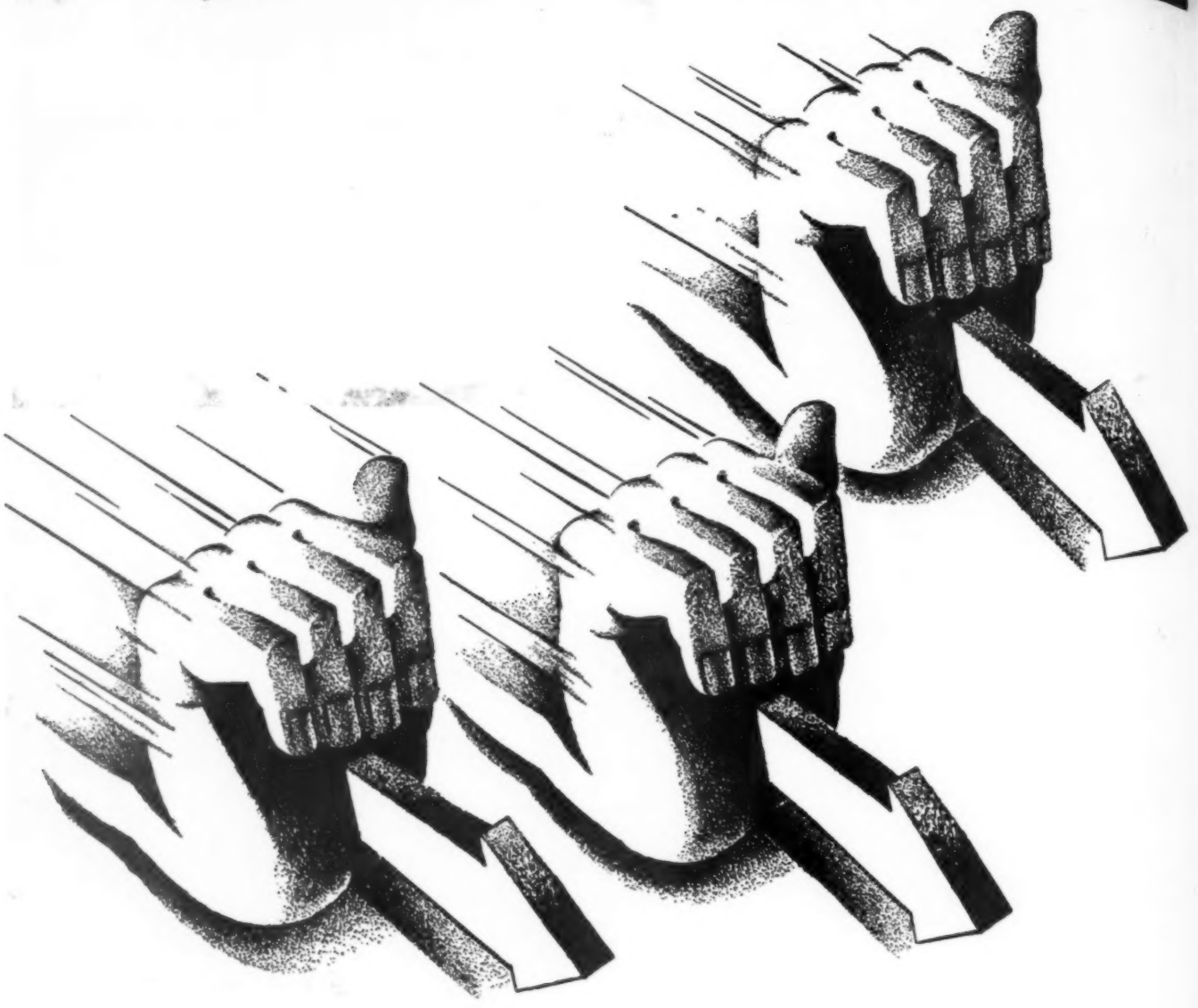
BECAUSE diaphragm completely separates fluids from working parts, mechanism of this valve is trouble-free—cannot freeze in outdoor service—and *no stuffing box or repacking* is required. Valve does *not* depend on metal-to-metal contact for closure. Hence *no leakage is possible* and *no reseating ever necessary*. Shape of weir prevents accumulation of solids—offers minimum resistance to flow—and *positive shut-off* is provided by diaphragm *even* when solids are trapped on the seat. Valve is installable *in any position* without danger of leaks. Suitable for on-or-off or for throttling service. Special types may be operated from remote points by air or water pressure, controlled by automatic timeclock or pilot. Write for McAlear Diaphragm Valve Bulletin.



H-W TYPE 1800 COMPACT BY-PASS MANIFOLD
Simplifies piping designs, eliminates a number of flanged or screwed connections, saves space, reduces leakage hazards without increasing installation costs. Sizes ⅛ to 4 inches. Bronze, cast iron, steel, union and bolted bonnets, screwed and flanged ends. Also silver braze and steel socket weld. Write for H-W Bulletin 117.

H-W McALEAR controls
PRESSURE · FLOW · LIQUID LEVEL · TEMPERATURE
for STEAM, WATER, AIR, OIL—GAS

THREE NEW PARTNERS ... GOING



TERMINAL TOWER
CLEVELAND, OHIO

AHEAD WITH DRESSER

DRESSER INDUSTRIES now number ten.

Formerly, we were seven companies helping to bring basic services to the user more efficiently.

Our three new partners, each a specialist in its fields, both round out and broaden Dresser's scope of usefulness. This larger Dresser group can now serve industry and consumers with more products and greater experience.

The new Dresser members are bulwarked by an organization that assures their customers continued progress in product improvement, greater wherewithal for pioneering research and steady maintenance of service.

Dresser Industries, Inc., has progressed through the management principle of giving to alert, independent know-how an adequate backing and pooled resources. From these, each member draws teamed strength far greater than it could enjoy alone. The three new members of Dresser Industries, Inc., increase opportunities for mutual aid among the teammates, and at the same time, draw from the group advantages for those they serve.

MEMBER COMPANIES

Dresser Manufacturing Division, Bradford, Pa.
The Bryant Heater Co., Cleveland, Ohio
Clark Bros. Co., Inc., Olean, N. Y.
Pacific Pumps, Inc., Huntington Park, Calif.
Bovaird & Seyfang Mfg. Co., Bradford, Pa.
Dresser Mfg. Co., Ltd., Toronto, Ont.
Van der Horst Corp. of America, Olean, N. Y. Cleveland, Ohio

PLUS

*International Derrick & Equipment Co., Columbus and Marietta, Ohio, Torrance, Calif. Beaumont, Texas
*Roots-Connersville Blower Corp., Connersville, Ind.
*Stacey Bros. Gas. Construction Co., Cincinnati, Ohio

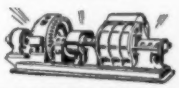
DRESSER Pipe couplings and repair devices for pipeline systems. Rings and forgings.

BRYANT Gas-fired boilers, winter air conditioners, furnaces, unit heaters and conversion burners for residential, commercial and industrial heating.

CLARK Engines and compressors for oil production and refining. Marine and stationary Diesel engines.

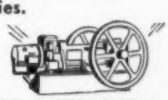
PACIFIC Hot-oil charging pumps; boiler-feed pumps; general-service pumps for the petroleum and other industries; oilwell plunger pumps; deep-well turbine pumps.

INTERNATIONAL DERRICK Oilwell pumping units, derricks and masts, drawworks, rotary tables and drilling units. Airport, communications and electric-power-line equipment and prefabricated steel buildings.



ROOTS-CONNERSVILLE Positive displacement and centrifugal blowers, exhausters, boosters and compressors. Air and liquid pumps and meters.

STACEY BROS. Storage holders, tanks and pressure vessels for the gas, oil, chemical and food industries.



BOVAIRD & SEYFANG Pumping engines, jacks, "powers", storage tanks and allied supplies and equipment for oilfields.

VAN DER HORST PORUS-KROME—a patented process of applying chromium lining on cylinder walls, piston rings and crankshafts—for longer wear.

DRESSER INDUSTRIES
INCORPORATED

THE IMPORTANT VALVES ARE THE ONES *YOU* USE!

Claims and counter-claims about Gate Valves mean nothing after they are installed on the job. It is PERFORMANCE that counts then and those valves are the ones you are vitally interested in. They must be dependable—they must operate smoothly—they must close tightly without leaking, and they must give years of service without undue maintenance.

Mueller-Columbians are just such valves. Due to the FOUR-POINT wedging action, the pressure is exerted at the EDGES of the valve discs. This prevents any chance of sprung or warped discs and insures tight closing. There are many other points of superiority that you should know about before you install any valve. Write us for full information today.

HYDRAULICALLY OPERATED GATE VALVE

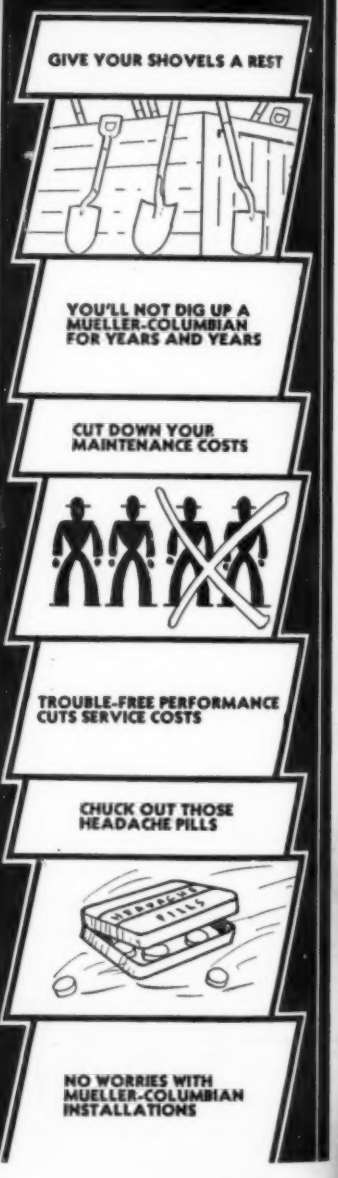
HAND OPERATED GATE VALVE WITH BY-PASS

SECTIONAL VIEW OF GATE VALVE

GATE ASSEMBLY (OPENED)

MUELLER CO.

CHATTANOOGA, TENN.


GIVE YOUR SHOVELS A REST
YOU'LL NOT DIG UP A MUELLER-COLUMBIAN FOR YEARS AND YEARS
CUT DOWN YOUR MAINTENANCE COSTS
TROUBLE-FREE PERFORMANCE CUTS SERVICE COSTS
CHUCK OUT THOSE HEADACHE PILLS
NO WORRIES WITH MUELLER-COLUMBIAN INSTALLATIONS

Preferred Protection

Your guarantee of dependable protection for water supplies is the uniformity, purity and highest quality of Diamond Liquid Chlorine.

DIAMOND ALKALI COMPANY

Pittsburgh 22, Pa., and Everywhere

DIAMOND LIQUID CHLORINE

LANDMARKS

Here a Ludlow List 75 Ludlow Slide Gate Hydrant, installed many years ago, still serves dependably, its good design truly at home amid the modern stores and apartments of suburban Boston.

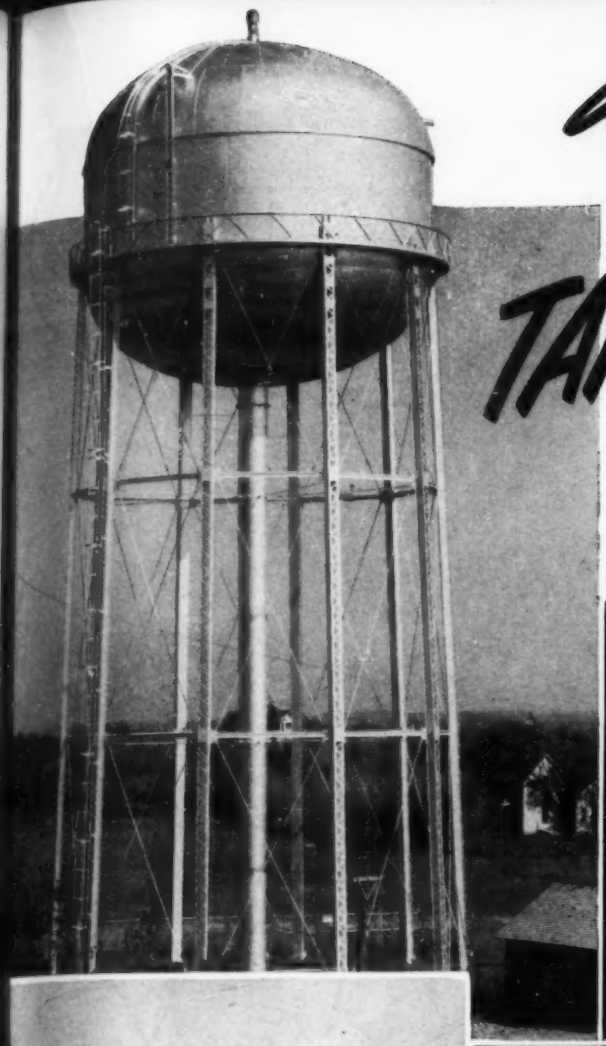
This Ludlow List 90 Slide Gate Hydrant is of recent design, and is set farther back from the curb, in accordance with modern practice. This current model offers many desirable features worth investigating.

In historic Brookline, Massachusetts Ludlow Hydrants take their traditional place in the American Scene

YEAR in and year out, Ludlow Hydrants serve on, although installation practice may change, and architectural treatments may vary. The List 90 Slide Gate model is now a general favorite the country over. It insures quick water, proper shut-off without water hammer, correct drainage and easy inspection and servicing. Full information, specifications and costs await your request.

LUDLOW HYDRANTS & VALVES
SINCE 1866

H-5 **The Ludlow Valve Mfg. Co., Inc., Troy, N. Y.**



Are you TAKING STEPS NOW

to assure better water service for the postwar years?

Elevated Steel Tank

by PITTSBURGH-DES MOINES

Now, unhurried judgment can prevail in the analysis of your local water storage requirements. Now, plans can be formulated, studied, reviewed and re-checked—so that when construction becomes possible, your community will gain by immediate readiness to proceed. Use the experience and planning facilities of Pittsburgh-Des Moines at the present favorable time—without obligation.

PITTSBURGH-DES MOINES STEEL CO.

PITTSBURGH, PA., 3414 NEVILLE ISLAND—DES MOINES, IOWA, 915 TUTTLE STREET

NEW YORK, ROOM 921, 216 BROADWAY · CHICAGO, 1218 FIRST NATIONAL BANK BUILDING

DALLAS, 1219 PRAETORIAN BUILDING · SAN FRANCISCO, 621 RIALTO BUILDING

SEATTLE, 522 EIGHTH AVENUE, SOUTH

How Four Great Guys Got The Surprise of Their Lives

Somewhere between India and China . . . over enemy territory . . . an American plane got into serious trouble. Both generators went out. The batteries started to burn. The plane was without instruments or lights . . . 20,000 feet up . . . *in the dark.*

The crew had only two alternatives . . . hit the silk or try their "Putt Putt."

This "Putt Putt" was a Homelite Portable Generator, installed in the plane as an auxiliary power plant and used for ground work only. The crew didn't think it would start because of lack of oxygen at this high altitude. But they tried . . . and it worked. Their electrical system was restored. They accomplished their mission. And then sat down and wrote us about it.

We were glad to get that letter. We know the skill and care that go into building Homelite 2-cycle gasoline-engine-driven generators . . . but frankly, we were surprised and more than a little proud of this unusual performance.

Surprises In Store for You

Wait until you get your next Homelite Portable Generator. Better bearings, more accurate balance, an improved cooling system, and a new cylinder design are just a few of the many new features that have stepped up so greatly the performance of Homelite Portable Generators.

For day in and day out all-weather operation of portable electric tools or floodlights, you won't find anything better than Homelite Portable Generators.

HOMELITE CORPORATION

PORT CHESTER • NEW YORK

PORTABLE PUMPS • GENERATORS • BLOWERS

Plan today . . .

. . . for your pipelines of tomorrow

Leading water works engineers are now preparing for peace with complete, detailed plans for new municipal supply lines. Judging from the blue-prints of the future, all indications point to a rapid residential and industrial growth of many cities and towns throughout the United States.

For many years Lock Joint Reinforced Concrete Pressure Pipe has been included in the specifications for the majority of all large diameter water pipe contracts and is playing an ever-increasing role in principal cities throughout the nation.

"Tailor-made" to fit the job, there is absolute assurance that strong, sturdy Lock Joint Pipelines are permanently immune to tuberculation and corrosion. City officials can depend upon permanent high carrying capacity and low cost operation for a century of useful service. Look to Lock Joint Reinforced Concrete Pressure Pipe as your most economical and safest post-war investment.

Whether your project is large or small, for the present or the future, your 'phone call, telegram, cable or letter to any of our offices will bring a prompt reply.

LOCK JOINT PIPE COMPANY

Established 1905

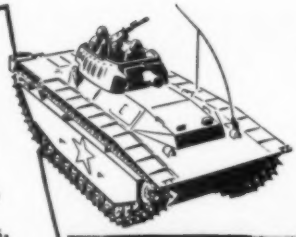
AMPERE, NEW JERSEY

Denver, Colo. • Chicago, Ill. • Kenilworth, N. J. • Kansas City, Mo. • Rock Island, Ill. • Joplin, Mo. • Valley Park, Mo. Cleveland, Ohio • Hartford, Conn. • Navarre, Ohio

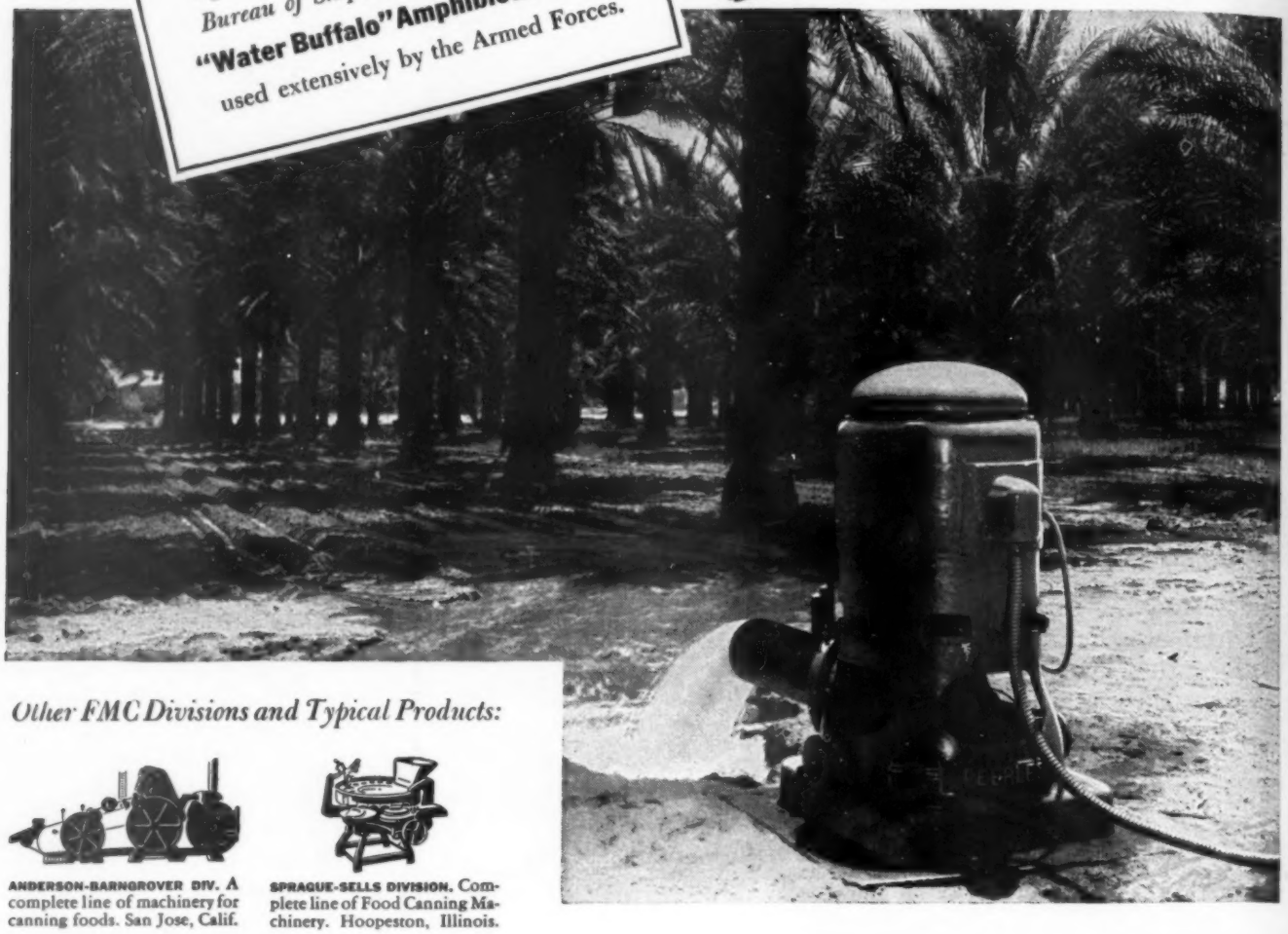
LOCK JOINT
Reinforced Concrete
PRESSURE PIPE

SCOPE OF SERVICES *Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply Mains as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous lines.*

Another product of the Company that designed (in cooperation with the U.S. Navy Bureau of Ships), engineered and builds **"Water Buffalo" Amphibious Tanks** used extensively by the Armed Forces.

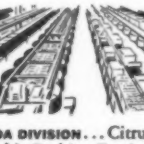


Seven of Food Machinery Corporation's fourteen major factories make "Water Buffalos" or sub-assemblies.



Other FMC Divisions and Typical Products:

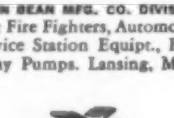
ANDERSON-BARNGROVER DIV. A complete line of machinery for canning foods. San Jose, Calif.



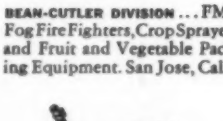
SPRAGUE-SELLS DIVISION. Complete line of Food Canning Machinery. Hoopeston, Illinois.

TEXAS DIVISION... Food Protective Processes, Fruit & Vegetable Packing Equipment, Canning Machinery. Harlingen, Texas.

FLORIDA DIVISION... Citrus and Vegetable Packing Equipment, and Food Protective Processes. Dunedin and Lakeland, Florida.

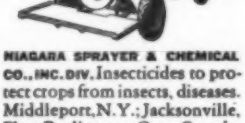


JOHN BEAN MFG. CO. DIVISION. Fog Fire Fighters, Automotive Service Station Equipt., Bean Spray Pumps. Lansing, Mich.



BEAN-CUTLER DIVISION... FMC Fog Fire Fighters, Crop Sprayers and Fruit and Vegetable Packing Equipment. San Jose, Calif.

RIVERSIDE DIVISION. Citrus Packing Equipment, Automatic Box Making & Lidding Machinery, Fruit and Vegetable Protective Processes. Riverside, California.



NIAGARA SPRAYER & CHEMICAL CO., INC. DIV. Insecticides to protect crops from insects, diseases. Middleport, N.Y.; Jacksonville, Fla.; Burlington, Ont., Canada.

Peerless Pumps

...bring deserts to life...supply water for entire cities

The irrigation pump pours out torrents of cool, clear water from deep underground, and arid wasteland turns green and bears fruit. In great cities and humming factories, batteries of pumps supply hundreds of thousands of gallons of life-giving water every minute. *Wherever water is pumped*—cities, factories, ranches, overseas with our armed forces—Peerless Pumps are known and preferred. Whatever its type—Turbine, Hi-Lift or Hydro-Foil—every Peerless Pump embodies the superb engineering, advanced design and sound construction that is typical of *all* products made by FMC.

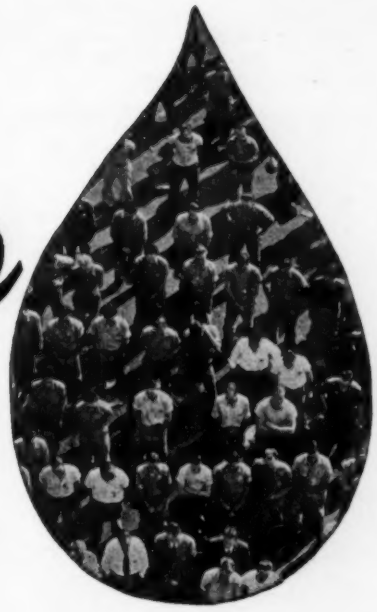
Lakeland
Riverside
Hoopeston
Los Angeles

FOOD MACHINERY CORPORATION

EXECUTIVE OFFICES: SAN JOSE, CALIFORNIA

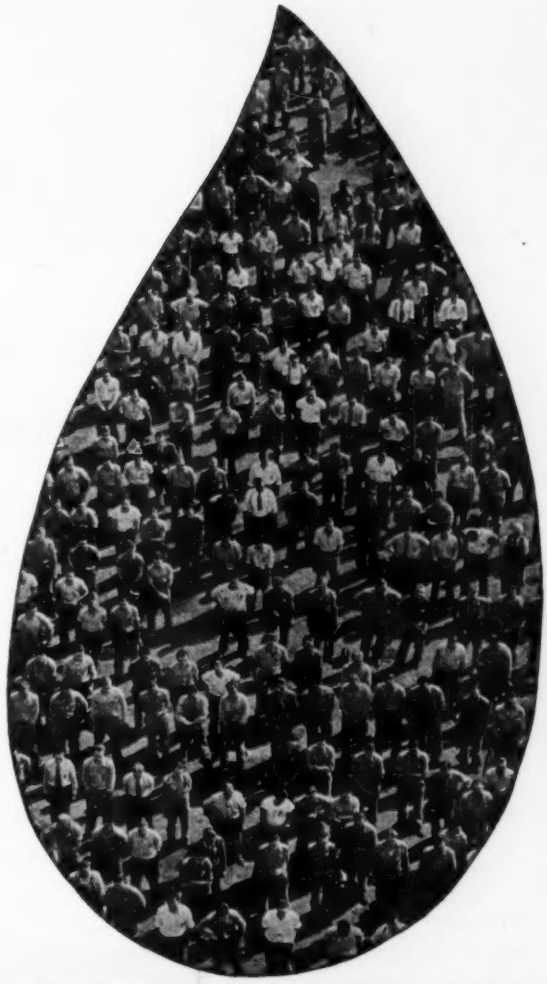
Peerless Pump factories are located at Los Angeles and Fresno, California; Canton, Ohio

Tough Customers



Waterworks engineers are "on the spot" 24 hours a day! Their customers are as tough as they come. Consumers *always* demand tasteless, odorless water—and seldom understand the waterworks superintendent's problems. Furthermore, they are not likely to extend congratulations for a job well done.

Superintendents will enjoy freedom from complaints by delivering palatable water. This can be attained by the use of Aqua Nuchar Activated Carbon to remove unwanted tastes and odors by *ad*sorption—an inexpensive, simple process.



An investment in Aqua Nuchar pays big dividends! More than 1200 communities have used Aqua Nuchar to deliver taste-free water at an average cost of two cents per capita per year.

Yes, Aqua Nuchar *is* inexpensive—and it keeps taxpayers happy. Investigate *now*—be prepared for the quick appearance of impurities in your water arising from winter's ice and snow.

Aqua Nuchar Activated Carbon is stocked at strategic points throughout the United States—ready to serve you on quick notice!

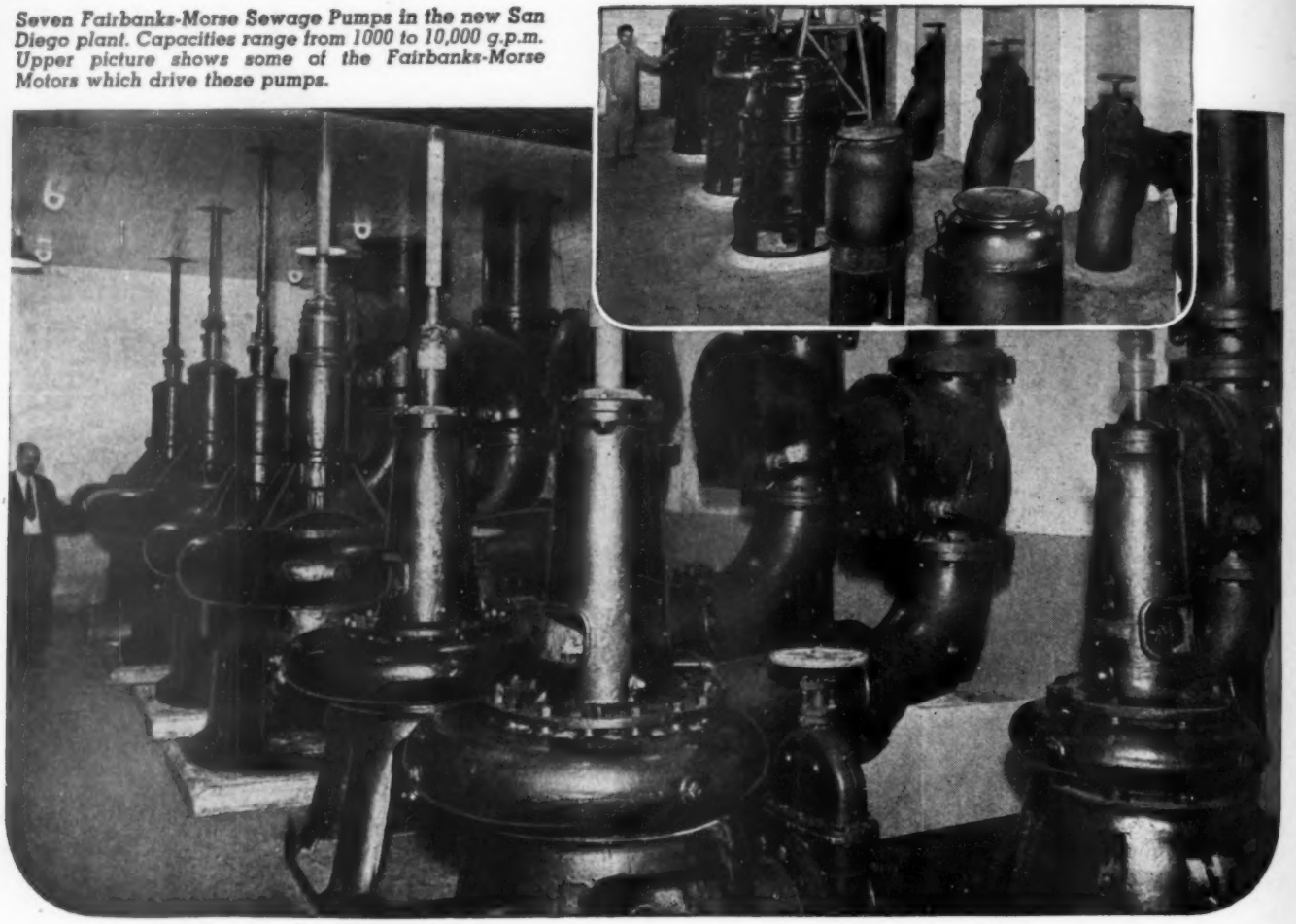
BLUEPRINT NOW!
But above all, remember there is a war yet to be won. Maintain equipment to assure operation at 100% efficiency.

NUCHAR

INDUSTRIAL CHEMICAL SALES
DIVISION WEST VIRGINIA PULP & PAPER COMPANY

230 PARK AVENUE, NEW YORK 17, N.Y.
35 E. WACKER DRIVE, CHICAGO 1, ILLINOIS
748 PUBLIC LEDGER BLDG., PHILADELPHIA 6, PA.
844 LEADER BLDG., CLEVELAND 14, OHIO

Seven Fairbanks-Morse Sewage Pumps in the new San Diego plant. Capacities range from 1000 to 10,000 g.p.m. Upper picture shows some of the Fairbanks-Morse Motors which drive these pumps.



New San Diego Plant Uses Fairbanks-Morse Sewage Pumps

The San Diego, California sewage treatment plant, put into operation in July, 1943, was designed with a generous reserve capacity. But wartime conditions so quickly swelled the city's population, that already the plant has operated many times at near capacity.

Thus the new plant promptly demonstrated its ability to handle heavy loads. It has demonstrated its operating economy, too . . . the first 2,024 million gallons of sewage were treated for only $14.75 per million gallons. Sales of fertilizer produced—$120 worth per day—pay a considerable part of the operating cost.

Contributing to the efficiency and economy of the San Diego plant are seven Fairbanks-Morse Sewage Pumps, each driven by a Fairbanks-Morse Motor.

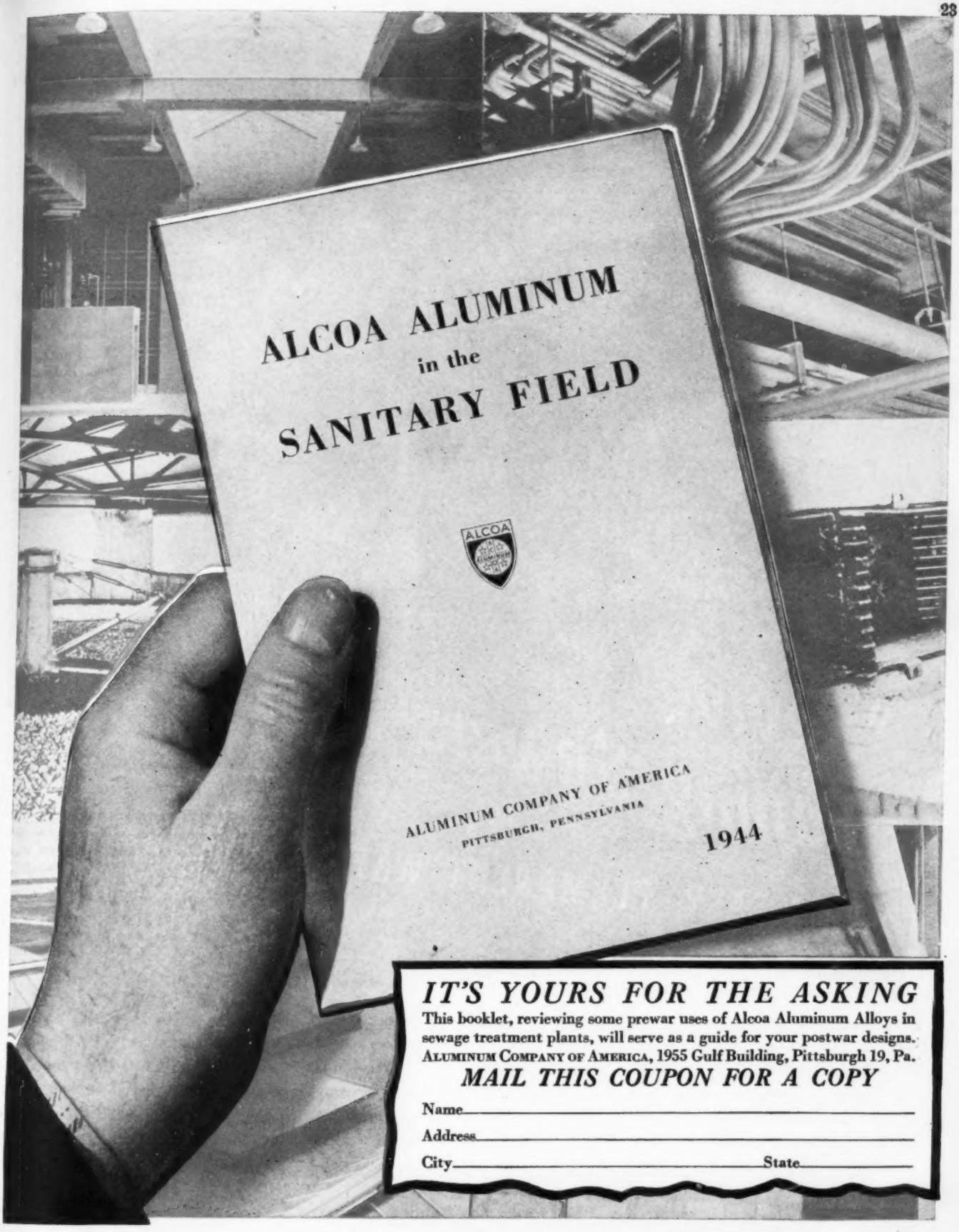
There are efficient Fairbanks-Morse Pumps for *every* municipal need, whether for sewage handling or for water supply. Let our pump engineers help solve your pumping problems without cost or obligation. Write Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

BUY MORE WAR BONDS

FAIRBANKS-MORSE

DIESEL ENGINES · WATER SYSTEMS
PUMPS · SCALES
MOTORS · STOKERS
GENERATORS · FARM EQUIPMENT
RAILROAD EQUIPMENT

Pumps



IT'S YOURS FOR THE ASKING

This booklet, reviewing some prewar uses of Alcoa Aluminum Alloys in sewage treatment plants, will serve as a guide for your postwar designs. ALUMINUM COMPANY OF AMERICA, 1955 Gulf Building, Pittsburgh 19, Pa.

MAIL THIS COUPON FOR A COPY

Name_____

Address_____

City_____ State_____

ALCOA FIRST IN ALUMINUM

ALCOA ALUMINUM

"Revive" Failing Sewers THIS EASY, PERMANENT WAY

Relining failed sewers is easy and quick — and permanent — with long lengths of sturdy Asbestos-Bonded ARMCO Pipe.

★ ★ ★

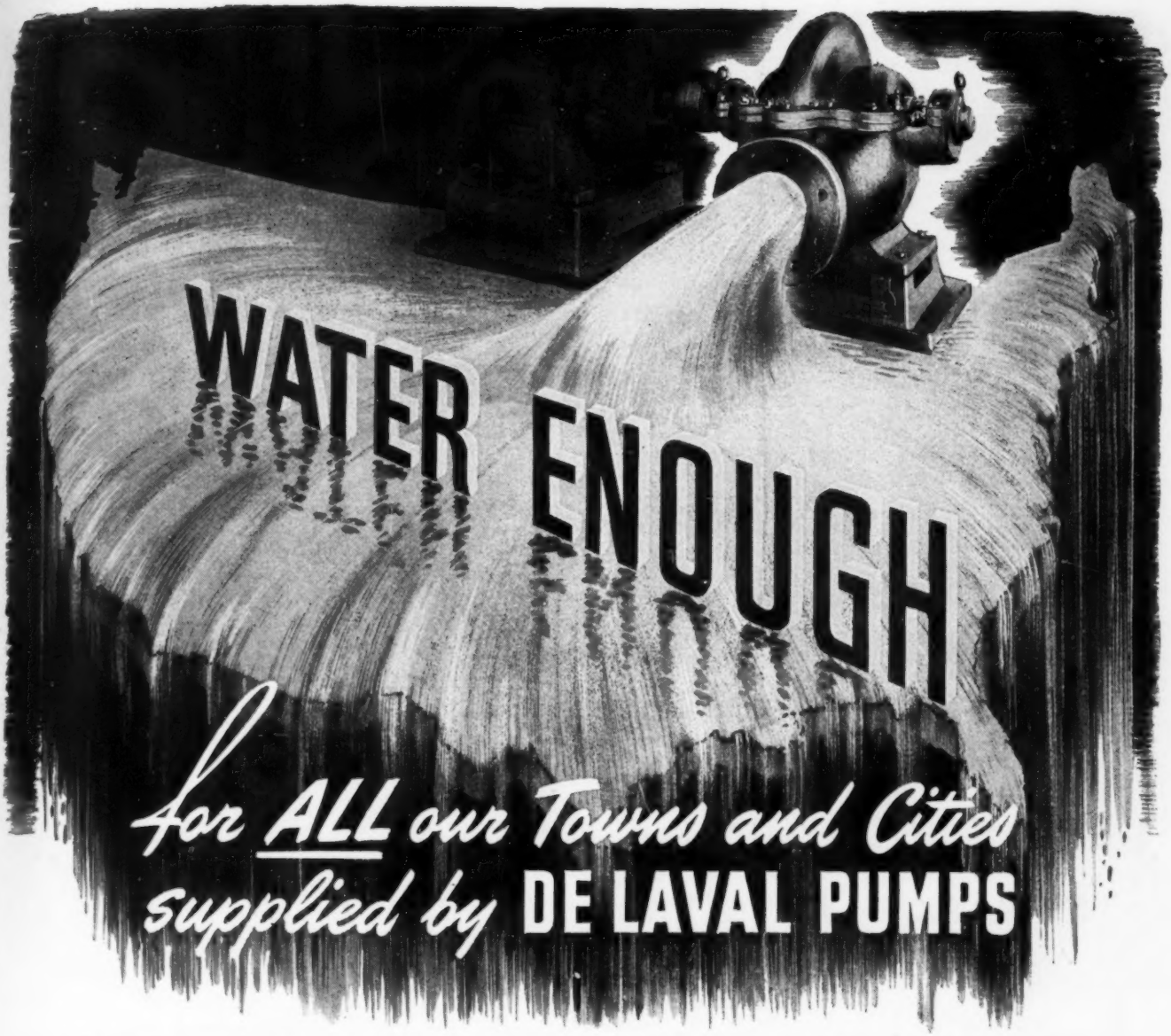
You can give failing sewers many more years of useful life by relining with durable, easy-to-install Asbestos-Bonded ARMCO Pipe. Job costs are low and the work moves fast. Long lengths of pipe, quickly joined with special inside band couplers, speed the job. Waterway is reduced a minimum because of the relatively thin walls of the corrugated pipe.

Fast as the work goes, you build for *permanence*. Flexible corrugated metal outlaws breakage. Corrosion is shackled by a full bituminous coating tightly bonded to the base metal. A thick bituminous pavement checks erosive action of sewage; makes the bottom last as long as the top.

Use Asbestos-Bonded ARMCO Sewer Pipe for essential repairs now, and design it into your post-war sewerage work. That way you "build for keeps" — provide your community with efficient, lasting, trouble-free sewerage. Our 48-page ARMCO Sewer Booklet will help you in your planning. Just write to Armco Drainage Products Association, 45 Curtis St., Middletown, Ohio.

ARMCO

ASBESTOS-BONDED ARMCO SEWER PIPE



WATER ENOUGH

for ALL our Towns and Cities supplied by DE LAVAL PUMPS

De Laval centrifugal water works pumps built to date have a total capacity in excess of 20 billion gallons daily—more than enough to supply all water requirements of the entire population of the United States. The City of Chicago, alone, is served by De Laval pumps having a total capacity of over one billion gallons daily; St. Louis, six hundred million; Cleveland, seven hundred million; Philadelphia, three hundred million; and so on down the list. In fact, 78% of all American cities of over 100,000 population are served by De Laval water works pumps.

De Laval Labyrinth wearing rings, sustain high efficiency

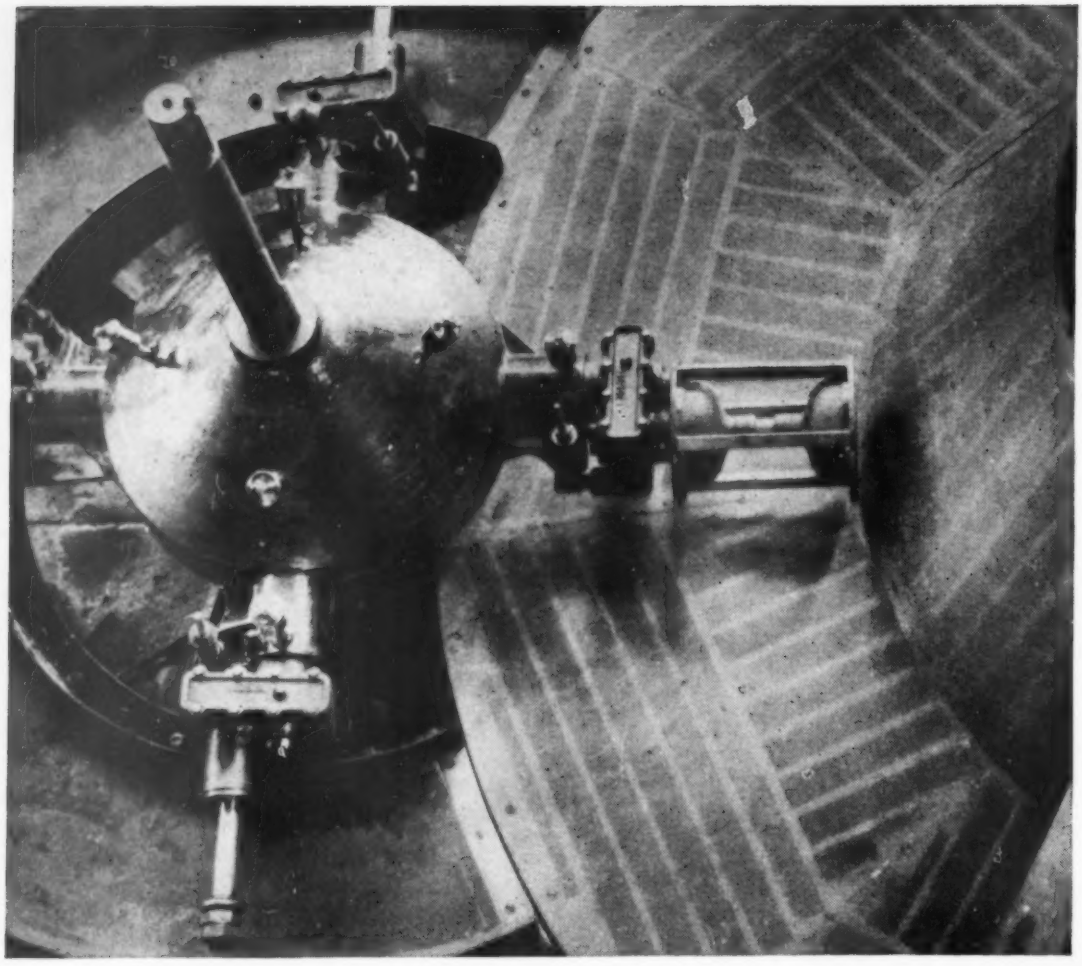
4111

TURBINES • HELICAL GEARS • WORM GEAR SPEED REDUCERS CENTRIFUGAL PUMPS • CENTRIFUGAL BLOWERS and COMPRESSORS • IMO OIL PUMPS

DE LAVAL

STEAM TURBINE COMPANY · TRENTON 2, NEW JERSEY

SALES OFFICES: ATLANTA • BOSTON • CHARLOTTE • CHICAGO • CLEVELAND • DENVER DETROIT • DULUTH • EDMONTON • GREAT FALLS • HAVANA • HELENA • HOUSTON KANSAS CITY • LOS ANGELES • MONTREAL NEW ORLEANS • NEW YORK • PHILADELPHIA PITTSBURGH • ROCHESTER • ST. PAUL • SALT LAKE CITY • SAN FRANCISCO • SEATTLE TORONTO • TULSA • VANCOUVER • WASHINGTON, D. C. • WINNIPEG



Shop assembly view of 12-foot EVERDUR sewage disc screen with revolving brush mechanism (brush staves not shown). Designed and furnished by Krajewski-Peeant Mfg. Corp., New York City, for the Stafford Springs, Conn., Sewage Treatment Works.

SEWAGE PLANTS THAT ARE BUILT TO *last*

USE *Everdur* EQUIPMENT

Here are just a few of the well-known plants using Everdur*... and the service record of this corrosion resistant metal to date:

ELIZABETH, N. J.	17 YEARS
DEARBORN, MICH.	12 YEARS
HAGERSTOWN, MD.	12 YEARS
CHICAGO, ILL.	10 YEARS
BOUND BROOK, N. J.	8 YEARS
WARD'S ISLAND, N. Y.	7 YEARS
RAHWAY, N. J.	7 YEARS
TALLMAN'S ISLAND, N. Y.	6 YEARS
SAN FRANCISCO, CAL.	6 YEARS

Everdur, the copper-silicon alloy of The American Brass Company, combines the tensile strength of mild steel with the corrosion resistance of pure copper. It is available in forms suitable for hot or cold working and for welding by commonly used methods with rods of the same material. Its outstanding use in the sewage field is due to its high resistance to corrosion and wide adaptability that includes its effective use in light weight, wrought, built-up structures. 44177

EVERDUR METAL

is used in sewage works for Coarse and Fine Screens, Swing Gates, Built-up Sluice Gates, Coarse Bar Rack Aprons, Effluent Weirs and Scum Weirs, Structural Scum Baffle Brackets, Troughs, Screen Hoppers, Orifices, Baskets, Anchors, Ladders, Float Gage Chains, Valve Springs, Manhole Steps, Guides, Walkways, Bars and Plates, Bolts and Nuts.

*Reg. U. S. Pat. Off.

ANACONDA *Everdur* METAL

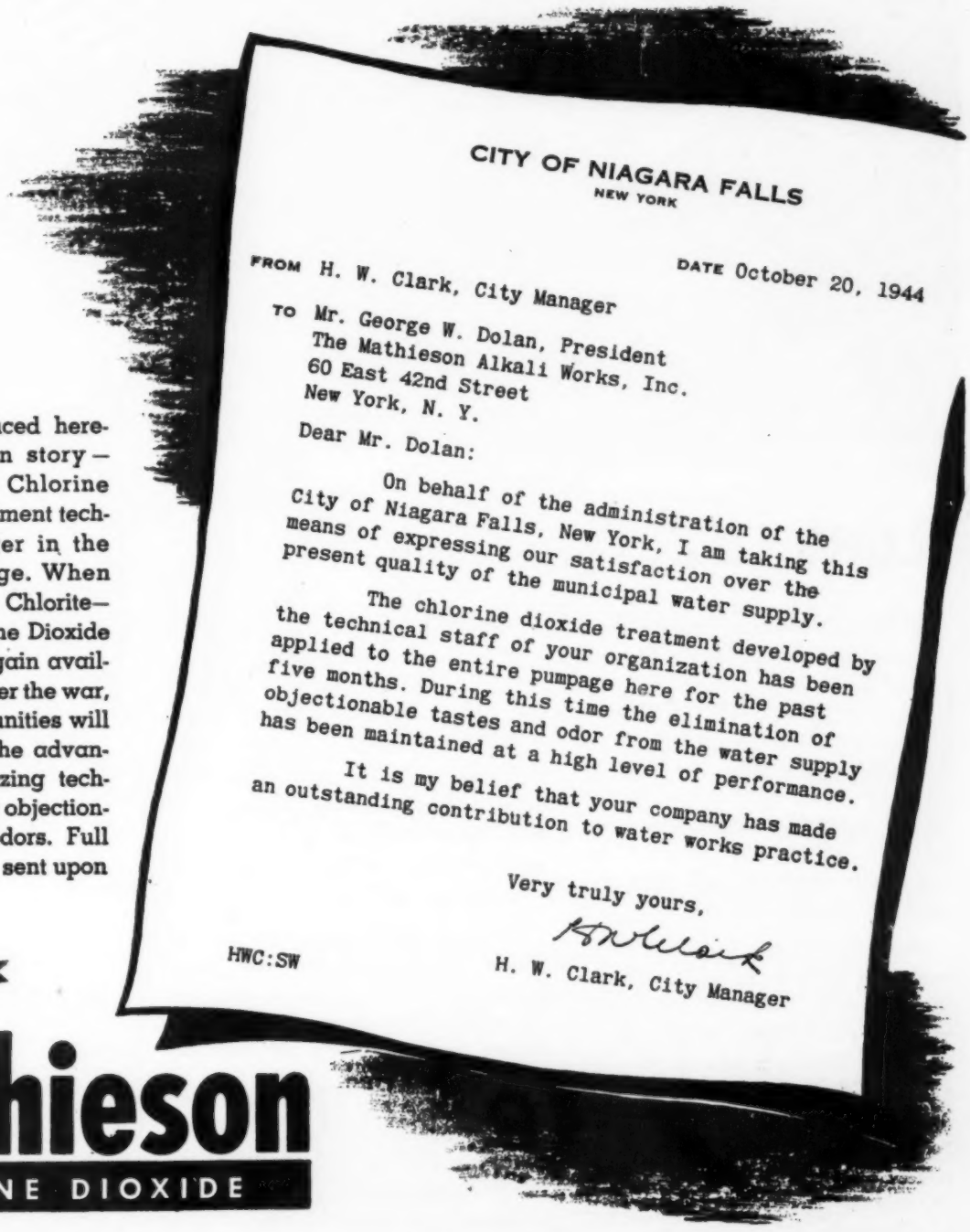
THE AMERICAN BRASS COMPANY—General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company—In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

BUY WAR BONDS... *THE VICTORY YOU DEPEND ON, DEPENDS ON YOU*

Attention!

WATER WORKS OFFICIALS



CITY OF NIAGARA FALLS
NEW YORK

DATE October 20, 1944

FROM H. W. Clark, City Manager

TO Mr. George W. Dolan, President
The Mathieson Alkali Works, Inc.
60 East 42nd Street
New York, N. Y.

Dear Mr. Dolan:

On behalf of the administration of the City of Niagara Falls, New York, I am taking this means of expressing our satisfaction over the present quality of the municipal water supply.

The chlorine dioxide treatment developed by the technical staff of your organization has been applied to the entire pumpage here for the past five months. During this time the elimination of objectionable tastes and odor from the water supply has been maintained at a high level of performance.

It is my belief that your company has made an outstanding contribution to water works practice.

Very truly yours,

H. W. Clark

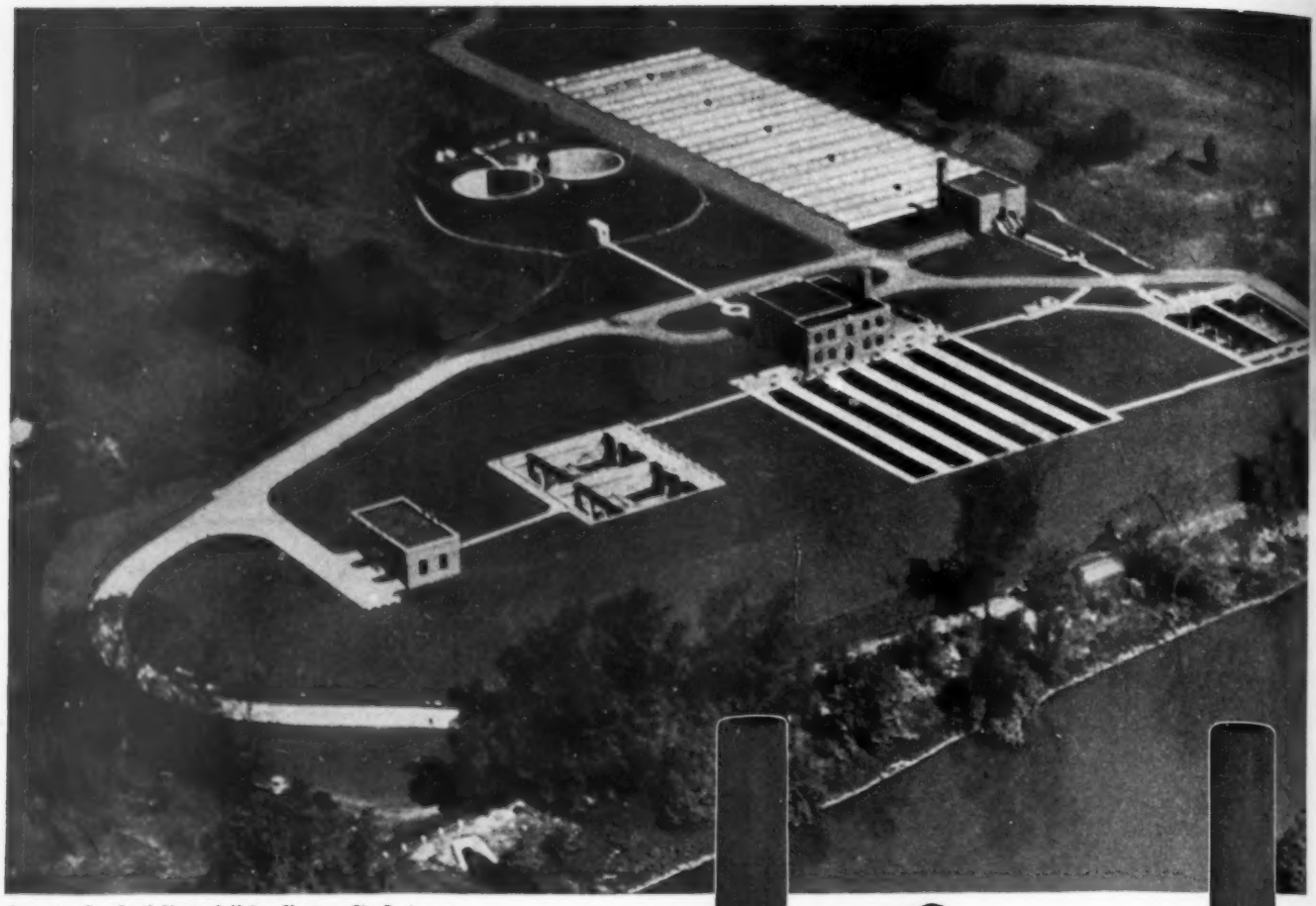
HWC:SW

H. W. Clark, City Manager

The letter reproduced herewith tells its own story—Mathieson's new Chlorine Dioxide water-treatment technique is no longer in the experimental stage. When Mathieson Sodium Chlorite—from which Chlorine Dioxide is generated—is again available in quantity after the war, many other communities will be able to enjoy the advantages of this amazing technique for removing objectionable tastes and odors. Full information will be sent upon request.

Mathieson
CHLORINE DIOXIDE

THE MATHIESON ALKALI WORKS (INC.) 60 EAST 42nd STREET, NEW YORK 17, N. Y.
SODIUM CHLORITE PRODUCTS . . . CAUSTIC SODA . . . SODA ASH . . . BICARBONATE OF SODA . . . LIQUID CHLORINE . . . BLEACHING POWDER . . . H T H PRODUCTS
AMMONIA, ANHYDROUS & AQUA . . . FUSED ALKALI PRODUCTS . . . SYNTHETIC SALT CAKE . . . DRY ICE . . . CARBONIC GAS . . . SODIUM METHYLATE



Lancaster, Pa., South Plant—J. Haines Shertzer, City Engineer.

LONG LIFE... one feature you want in air diffusers

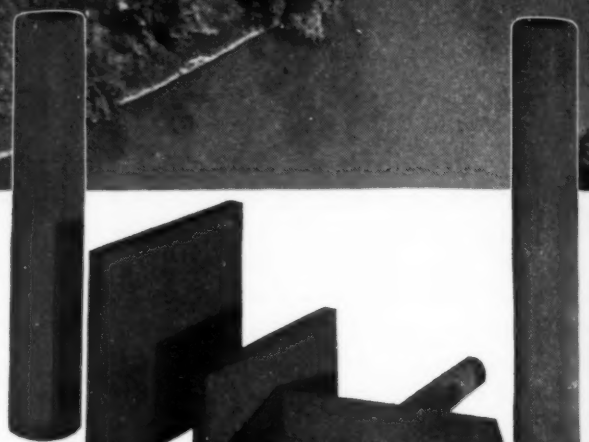
Long service from any diffuser depends primarily upon prevention of clogging. For one thing, this means a continuous supply of clean air. But since operating conditions are not always just right, diffusers will clog in time. And this is where you get what you want in "ALOXITE" diffusers.

Made from electrically fused aluminum oxide grain combined with proper ceramic bonds, "ALOXITE" plates and tubes are exceptionally resistant to the various acid solutions used for effective cleaning. As a result, these diffusers may be cleaned and used repeatedly. They also withstand reburning—a considered method of restoring plates and tubes that become completely clogged.

Furthermore, "ALOXITE" plates and tubes are amply strong and rugged to prevent breakage during removing, handling and replacing.

At the plant illustrated, "ALOXITE" diffusers have given over ten years of uninterrupted service and are going strong. And this is but one of many installations where exceptionally satisfactory results are being obtained.

To get the long life you want from your air diffusers, insist on the use of "ALOXITE" aluminum oxide plates or tubes.



THE CARBORUNDUM COMPANY
Dept. W-1
Refractories Division
Perth Amboy, New Jersey

"CARBORUNDUM" and "ALOXITE" are registered trade marks of, and indicate manufacture by, The Carborundum Company.

Porous Products by CARBORUNDUM
TRADE MARK

NOT HEROIC LIKE THIS LEGENDARY LAD . . .

BUT . . . THIS FINER JOINTING COMPOUND

STOPS LEAKS

BY PREVENTING THEM

Of course you've read of the heroic Dutch lad who held the leak in the dyke with his arm until help came to prevent inundation.

MOST LEAKS in water mains result from vibration. Such leaks seldom threaten catastrophic inundation, but they do mean a loss of precious water and expensive excavation and repairs.

Joints made with lead or similar materials continue to leak until excavated and repaired. *Tegul*-MINERALEAD joints however, usually have ample strength and plasticity to withstand even severe vibration such as occurs in lines on bridges or under railroad tracks. In the rare event that a small leak should develop, the sulphur element in *this* compound goes to work at once and the leakage seals automatically. No excavating or repairs are necessary.

This is one of a number of ways in which *Tegul*-MINERALEAD helps cut down line maintenance costs. Its economies extend also to laying, for that inevitable initial leakage usually ceases much sooner with this sulphur base compound.

Using *Tegul*-MINERALEAD you can proceed at once with back-filling and consequent clearing up of traffic hazards that come from open trenches.

When you plan your next installation of Bell & Spigot Main, plan also to save time, trouble and laying and maintenance cost by using

OTHER IMPORTANT ADVANTAGES OF

Tegul-MINERALEAD

The ingot form is easily handled, shipped, stored and worked • Unaffected by moisture, it needs no protection from storm or flood when stored in the open • No possible change of physical composition can result from travel jolting • Requires no skilled labor, caulking or deep bell holes.

Write for literature about this better jointing compound in 10 lb. ingot form.

THE ATLAS MINERAL PRODUCTS COMPANY
Mertztown of Penna.
Pennsylvania

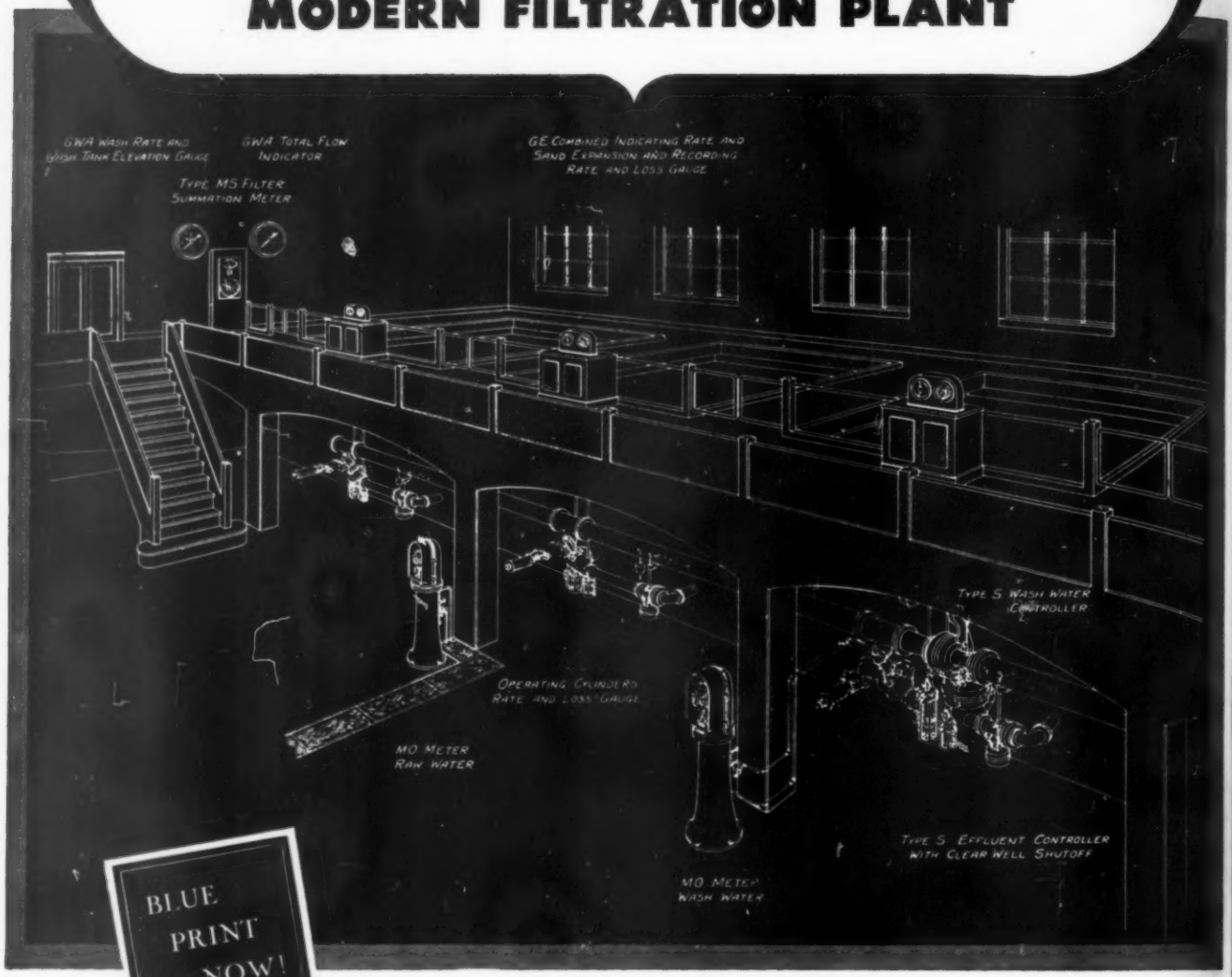
The House of Jointing Materials

*ATLANTA 3, Ga., 610 Red Rock Bldg.
*CHICAGO 1, Ill., 333 No. Michigan Ave.
*DALLAS 5, Tex., 3921 Purdue St.
*DETROIT 2, Mich., 2970 W. Grand Blvd.
*KANSAS CITY 2, Kan., 1913 Tauromee Ave.
NEW YORK 16, N. Y. 280 Madison Ave.
PITTSBURGH 10, Pa., 4656 Old Boston Rd.
TORONTO, Ont., McRae Engineering Equipment, Ltd., 11 King St., West

THE ATLAS MINERAL PRODUCTS COMPANY of California
REDWOOD CITY, California

*DENVER 2, Colo., 1921 Blake St
*LOS ANGELES 12, Cal., 817 Yale St.
*SEATTLE 14, Wash., H. D. Fowler Company P. O. Box 3084

A "Gallery" of SIMPLEX EQUIPMENT for the MODERN FILTRATION PLANT


GWA Wash Rate and Wash Tank Elevation Gauge
GWA Total Flow Indicator
Type MS Filter Summation Meter
G.E. Combined Indicating Rate and Sand Expansion and Recording Rate and Loss Gauge
Type S Wash Water Controller
Operating Cylinder Rate and Loss Gauge
MO Meter Raw Water
Type S Effluent Controller with Clear Well Shutoff
MO Meter Wash Water
BLUE PRINT NOW!

Simplex has a background of experience in the modernization of water treatment and sewage plants which is well recognized. Our specialized knowledge may well be of value to you in the pre-blue print stage just as Simplex equipment will put the blue print into action after installation. We would be pleased to talk over with you your plans for improving the efficiency of your plant now or in the future.

SIMPLEX VALVE & METER COMPANY

6743 UPLAND STREET, PHILADELPHIA 42, PA.

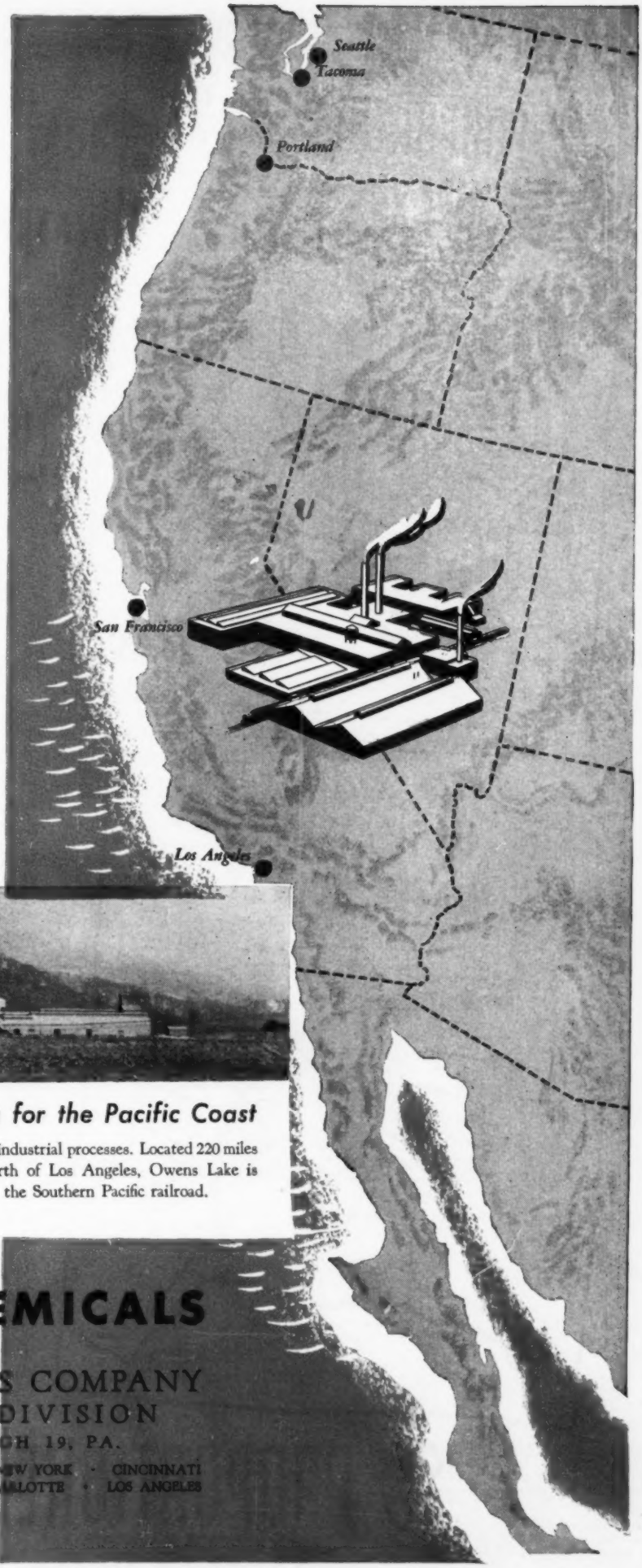
COLUMBIA makes another contribution to national industrial progress . . .

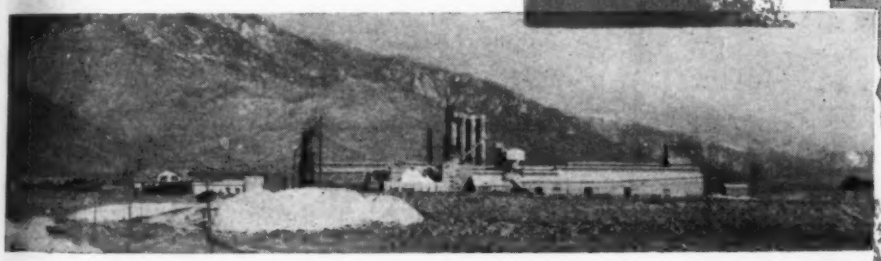
Pacific Coast Production

The entire nation looks ahead to the continued expansion of Pacific Coast industry, so necessary to America's future. Columbia is proud to join with the hundreds of industries which will help to add this important chapter to American industrial history.

As announced recently, the Pacific Alkali Company has become a Columbia division. Pacific's rich alkali deposits provide the source of an abundance of essential industrial chemicals. And the production and distribution facilities of Columbia combine to guarantee that these needs of industry, up and down the Pacific Coast, will be efficiently and economically served.

This expansion of Columbia facilities is another example of its progressive policy which seeks not only to serve the immediate needs of its customers throughout the nation, but to anticipate them to as great an extent as possible.





OWENS LAKE, *Rich Source of Alkalies for the Pacific Coast*

Owens Lake is a natural deposit of alkalies consisting principally of Soda Ash, Borax and Sesqui-Carbonates . . . chemicals essential in numerous industrial processes. Located 220 miles to the north of Los Angeles, Owens Lake is served by the Southern Pacific railroad.

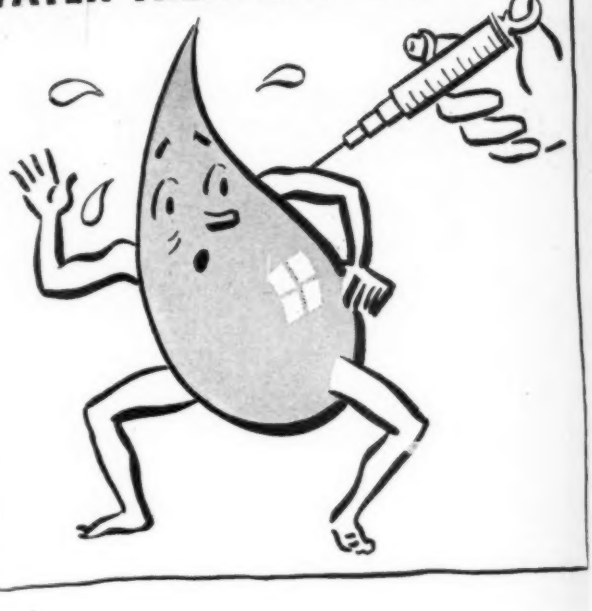
COLUMBIA CHEMICALS

PITTSBURGH PLATE GLASS COMPANY
COLUMBIA CHEMICAL DIVISION
GRANT BUILDING · PITTSBURGH 19, PA.

CHICAGO · BOSTON · ST. LOUIS · PITTSBURGH · NEW YORK · CINCINNATI
CLEVELAND · PHILADELPHIA · MINNEAPOLIS · CHARLOTTE · LOS ANGELES

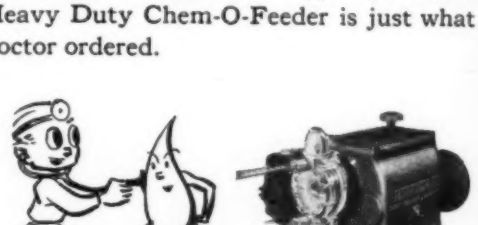
call in
% PROPORTIONEERS %
HEAVY DUTY CHEM-O-FEEDER

to inject
JUST THE RIGHT AMOUNT *of* WATER TREATING CHEMICAL



to make a HEALTHY WATER SUPPLY

If you've been limping along with a water supply of inferior quality or are having difficulty with obsolete or troublesome water treating equipment, · %Proportioneers% Heavy Duty Chem-O-Feeder is just what the doctor ordered.



Heavy Duty Chem-O-Feeder.
Capacity to 7 G. P. H. against 85 lbs. per sq. in. pressure.

This economical pump is designed to feed all water treating chemicals. It does not require an expert operator and its feeding rate is instantly adjustable. Modern design, with long-lived diaphragm and See-Thru plastic head for visible feed, assures long, trouble-free service. Send for Bulletin SAN-2.

% PROPORTIONEERS, INC. %

9N CODDING ST., PROVIDENCE, R. I.

WATER WORKS & SEWERAGE

PUBLICATION OFFICE
330 South Wells Street, Chicago, Ill.
E. S. Gillette, Publisher

EDITORIAL OFFICE
155 East 44th Street, New York, N. Y.
L. H. Enslow, Editor

COMING!

"Developments of the Year in Sewage"

Is the annual review of developments in the field of sewerage, sewage treatment and industrial wastes treatment to be featured in our February issue, as in the past. Those who have read similar reviews by this year's author will need no further urging not to miss this one. In addition to having attained high recognition in the water works field, he is now the President of the Sewage Works Federation.

ALBERT E. BERRY, Ph.D., Chief Engr.
Ontario Dept. of Health, Toronto.

Fire Hydrant Discharge Measurements

An article by the same author in our December issue describes the pressure gage method and a special gage for the purpose of making hydrant flow tests. The forthcoming article describes another method. It came from—

A. A. HIRSCH, Director,
School on Water Supply and Sewerage,
Baton Rouge, La.

Corrosion of Iron by Sulfides

Is an article which presents a number of typical cases wherein sulfides contained in the water, sewage, or sludge have been the cause of corrosion of iron. The phenomenon of sulfide corrosion, which is not an infrequent occurrence, is of practical importance and the principles of its action as well as suggested remedial measures are discussed in this paper by—

RICHARD POMEROY, Consulting Chemist,
Pasadena, Cal.

Treating Metal Wastes to Remove Cyanides

The treatment of wastes from electro-plating establishments has long been a problem. The plant constructed to treat such wastes, and the method of destroying the lethal cyanides developed with successful results; are described by—

FRANCIS S. FRIEL, Consulting Engineer,
and
GORDON J. WIEST,* Tech. Service Dept.,
Penna. Salt Mfg. Co., Philadelphia, Pa.
(*Until recently of Albright & Friel, Engrs., Phila., Pa.)

Locating Water Leaks by Modern Methods

Is a story from Buffalo where one leak, amongst others, was run down to the tune of a stop-loss of 1,750,000 gpd. How Buffalo locates main and service leaks is told by—

ALAN DRAKE, Director of Water,
Buffalo, N. Y.

Water Meters—Their Testing, Repair and Performance

Comes from a man who is well qualified to write on this topic. He presents some excellent discussion of the why and how of water meters, their care and testing procedures on a streamlined basis. This contributor is—

J. FRED KELLER, Distr. Manager,
Pittsburgh-National Meters, Pittsburgh, Pa.

Cleaning Meter Casings

Is a brief article which fits in with the above article. It was supplied by—

WENDELL R. LA DUE, Chief Engr. and Supt.,
Div. of Water and Sewerage, Akron, Ohio.

With considerable regret we are unable to report in this issue, as planned, meetings of the following associations:

4 States Section of AWWA.
South Dakota Water & Sewage Conf.
Florida Section of AWWA.
Indiana Conf. on Industrial Waste Treatment.

VOL. 92, NO. 1

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H. P. Gillette, Pres.; E. S. Gillette, Vice Pres. and Publisher; L. H. Enslow, Vice Pres. and Editor; J. C. Black, Mgn. Editor; George E. Symons, Associate Editor; Editorial Associates—J. R. Baylis, A. M. Rawn, H. A. Faber; H. J. Conway, Adv. Editor; B. I. Campbell, Make-Up Editor. *Chicago Office*, E. H. Hickey, Rep., 330 S. Wells Street; *Cleveland Office*, Lee B. McMahon, Mgr., Leader Bldg.; *New York Office*, J. M. Angell, Jr., Mgr., 155 East 44th Street; *Los Angeles Office*, Don Harway, Rep., 816 W. Fifth Street.

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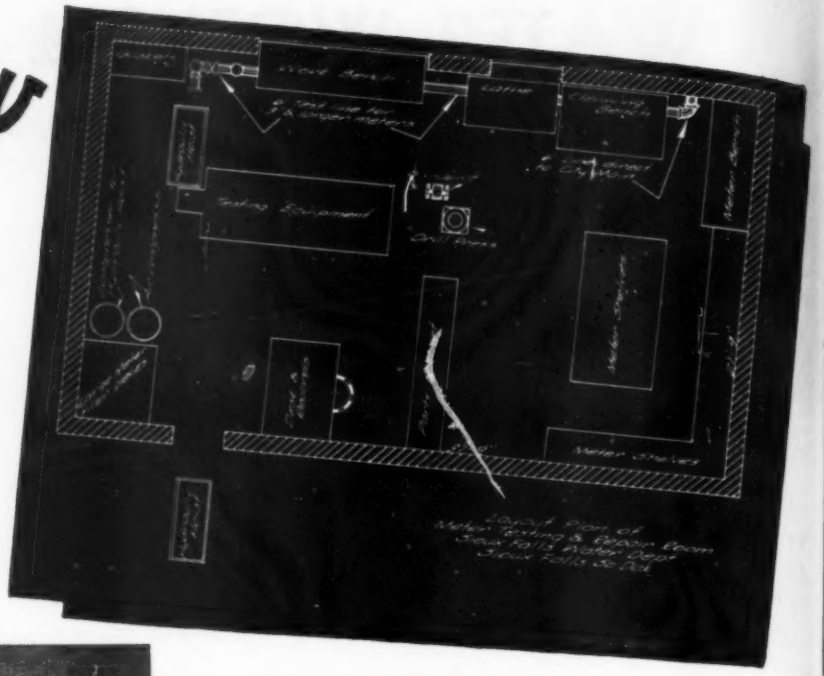
Plan Now for a MODERN METER SHOP



● *Layout Plan of Meter Testing and Repair Shop, Sioux Falls Water Department, Sioux Falls, So. Dakota. Note location of hydraulic lifts.*

An Ingenious Method of Handling Large Meters

Two hydraulic lifts are used in the Sioux Falls meter shop. One, outside the door, takes heavy meters off, or lifts them up to, the truck. The other, inside the shop, lifts meters up to the proper level for test connections, then lowers them when tests are completed. By means of these lifts, the Sioux Falls Water Department saves time and labor in handling heavy meters.

A GOOD meter repair man will do better work when he has good tools and a well planned place in which to work.

That is why your post-war planning should include your meter shop. The proper arrangement of the necessary work benches, parts-bins, testing bench, etc. will enable the meter man to do a better job. An efficient meter shop need not be elaborate nor expensive . . . but remember that it is the heart of the metering end of your water system; and it will pay you to plan it carefully.

Your Trident representative has broad experience with modern meter shop practice in his territory, and will be glad to help you.

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NEPTUNE METER COMPANY • 50 West 50th Street • New York 20, N. Y.

Branch Offices in CHICAGO, SAN FRANCISCO, LOS ANGELES, PORTLAND, ORE., DENVER, DALLAS, KANSAS CITY, LOUISVILLE, ATLANTA, BOSTON.

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WATER WORKS
& SEWERAGE

VOL. 92, No. 1 *A Gillette Publication* JANUARY, 1945

DEVELOPMENTS OF THE YEAR IN WATER SUPPLY

By SAMUEL F. NEWKIRK, JR.*
Engineer and Superintendent
BOARD OF WATER COMMISSIONERS
ELIZABETH, N. J.

(*President of the Am. Water Works Assn.)

The Author

THE third year of our participation in the war found the water works industry, as well as many other industries, making every effort to bring this world-wide catastrophe to a speedy and, for us, victorious finale. All activities have had this as their goal; consequently, in looking back over the year's events, one sees little but incidents connected with the war effort. Those events directly connected with the manufacture of war implements cannot be recited for reasons of security. This is also true of events on the field of battle.

In 1944, as in the immediate past, many water works have had to increase capacity to meet the new and increased demands for water for industrial uses, and in many cases to supply increases in population caused by an influx of war workers. Meeting these increased demands was accomplished in one or more of several ways, to wit: By drilling additional wells to increase the yield from sub-surface supplies; by alterations and additions to treatment plants and pumping stations, many of which were overloaded; and by construction of additional supply lines and distribution system reinforcements.

Water is a prime necessity and the work of delivering it has been recognized by the War Production Board as an essential industry. Water is a necessity not only to manufacturing on the home front but it is vital to the troops in the field as well. It is reported that some of the very first equipment landed during the Normandy invasion was for supplying our gallant forces with a satisfactory water supply.

The task of supplying a safe and satisfactory water in the quantities required, under the strain of war, has continued to be tremendous and the water works fraternity can view its accomplishments with pride. There is no report of serious curtailment of war-time activities in any locality due to insufficient water supply although, in a few locations, there were threats of a shortage which, fortunately, failed to materialize.

Shortages Met

Instances of temporary and unusual expedients to provide water are many. An outstanding one was the procedure resorted to at Louisville, Ky. The ground water supply had become depleted in the fall of 1943 because of pumping during the summer to supply large volumes of cool water for the distilleries making alcohol for the rubber program. The regular Louisville water supply which is taken from the Ohio river is too warm during the summer to use for this purpose, although there is ample quantity. When the temperature conditions were right the distilleries stopped pumping and substituted the regular Louisville supply, but it was feared that the distilleries would have to curtail their activities during the summer of 1944 because of the depleted ground water.

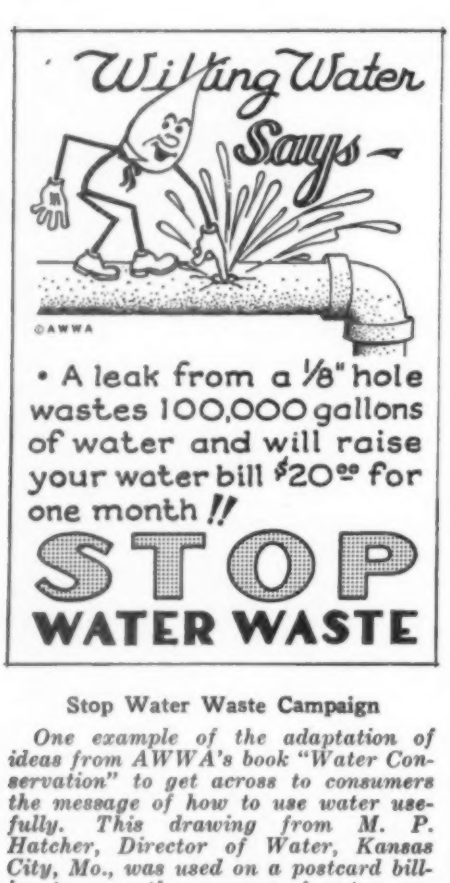
To overcome this threat, surplus cool water from the Louisville supply in the amount of 400 mil. gal. was dumped down the wells in the winter until the ground water level was nearly up to the surface. This unusual expedient, in connection with the installation of additional recirculating equipment in the distilleries, permitted normal operations during the summer of 1944 and ended a threatened let-down in the rubber program.

Another example of meeting water shortage was in connection with new war industries built in the area north of Detroit, where it appeared impossible to provide adequate water so far beyond the normal distribution limits. The difficulty was overcome in late 1943 by pumping water in the daytime from the reservoir of the city of Highland Park, with pumps loaned by Philadelphia installed with equipment and appurtenances from a number of sources, and letting

the reservoir refill at night from the Detroit system.

War Production Board Regulations

The War Production Board, by several amendments in 1944, liberalized Utilities Order U-1 and supplementary orders in the U-1 series and simplified procedures, regulations and record-keeping in connection with the purchase and use of materials for maintenance, repair and operating supplies, and making minor plant additions under wartime conditions. Utilities, whose inventory, excluding fuel and other material specifically excluded, is $25,000 or less, need not maintain their inventory by material classes and are no longer subject to restrictions on inventory and on the dollar value of material that may be purchased. Materials, however, must not be ordered in excess of 90 days' supply. Continuous records of excess inventory need not now be kept, and material in excess inventory need not be offered for sale or sold except to another utility for the repair of an actual breakdown. It is hoped that the practice of selling excess inventory to other utilities will continue on a voluntary basis.


Willing Water Says—
©AWWA
• A leak from a 1/8" hole wastes 100,000 gallons of water and will raise your water bill $20.00 for one month !!
STOP
WATER WASTE

Stop Water Waste Campaign

One example of the adaptation of ideas from AWWA's book "Water Conservation" to get across to consumers the message of how to use water usefully. This drawing from M. P. Hatcher, Director of Water, Kansas City, Mo., was used on a postcard billing to carry the message of water conservation to customers. The Willing Water sketch was printed on the address side of the postcard bill.

The clearing of purchases through the Regional Utilities Engineers was discontinued. The net dollar value of material included in a minor plant addition was increased to $10,000, and all former requirements in the Housing Utilities Standards were discontinued. Cast iron, carbon steel and non-metallic pipe may be ordered in minimum carload quantities and any other material in minimum procurable commercial quantities without violating restrictions on ordering material. Material designated as surplus to the war effort, and offered for sale by any Federal government agency having jurisdiction over its disposal, if purchased, is not subject to delivery restrictions and may be excluded from inventory.

Copper Situation

The frozen inventories of copper and copper-base alloy pipe tubing and fittings in the hands of utilities were freed for underground construction in January and, in November, permission was given to manufacture and distribute a limited amount. Utilities are cautioned to exercise restraint in placing orders for this material and are requested to restrict their purchases to no more than sixty days' requirements. In June, restrictions were lifted sufficiently to permit the manufacture of a limited amount of one-inch and smaller bronze meter casings.

Post-War Planning

The Committee on Water and Sewage Works Development sponsored by the American Water Works Association, the New England Water Works Association, the Federation of Sewage Works Associations and the Water and Sewage Works Manufacturers Association completed the first phase of its work on June 30. This phase consisted of promoting, among water and sewage works executives and those responsible for public works planning, a realization of the value of preparing plans now, for necessary water works and sewage works construction to be done as soon as wartime restrictions are lifted. This work was accomplished by appearances of an employed field director and others before water works and sewage works group meetings; by personal contacts with those having an interest in water works and sewage works planning and the circulation of pertinent literature.

At the end of the first phase of the work the committee decided to continue to promote construction of water works and sewage works by mailing promotional literature and cooperating as required until June 30, 1945, with state sanitary engineers and others.

It is difficult to appraise the value of this committee's work, but there is evidence that the work has been responsible for the awakening of planning activities that might long have remained dormant and the progress made may well be considered to the credit of the committee.

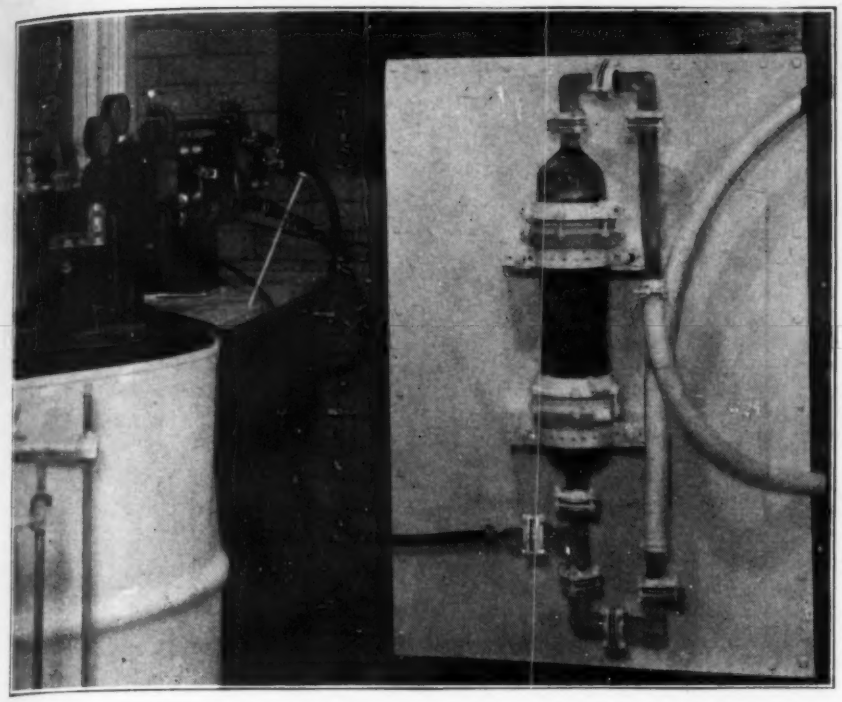
That there is a field for planning of water works is evidenced by the United States Public Health Service report, which indicates that new and extended water supply systems to cost $803 million are needed to serve adequately the 86,300,000 people now served. Of this amount $181 million is to construct new systems, $502 million is for extensions and improvements to existing systems in 6,455 communities and $120 million is for softening water supplies needing but not now receiving such treatment. Also, $265 million is needed to provide safe water supplies to the 5,295,000 rural homes that need them.

Although post-war planning is proceeding apace in many localities, in far too many places it has not advanced beyond the wishful thinking stage. Plans for financing seem to be the deterrent as many are looking, with hope in their eyes, to the federal government for assistance although they are in better financial condition than is the government.

One of the most outstanding efforts to overcome these deterrents to post-war planning is a brochure issued by the State of Indiana and titled "Water and Sewerage Systems of Indiana—The Planning of Future Construction Now." In November 1944 *Water Works and Sewerage* commented on this brochure as follows:

"This remarkable volume was developed as a joint undertaking by the Department of Government of Indiana University and the Division of Sanitation of the Indiana State Department of Health, for the purpose of stimulating planning of water supply and sewerage betterments throughout Indiana as post-war projects. It was prepared expressly as a guide to municipal officials and a "know-how" handbook on the planning of and ways and means of legally financing new water and sewage works, or securing and paying for betterments to existing systems.

"Especially are the following sections of the brochure illuminating and praiseworthy—'Why Carry on Water Works and Sewerage Improvements?'; 'The Financial Capacity of Municipalities'; 'Legal Methods of Financing Water and Sewage Works Better-



Close-up View of Auxiliary Equipment Required to Generate Chlorine Dioxide
(Chlorite solution pumped from solution tanks at the left and chlorine solution fed from chlorinator to the right, react in the mixing glass to form a solution containing the powerful oxidant chlorine dioxide.)

ments'; 'Sound Financing, without Jeopardizing the Borrowing Power of a Community.' Of particular interest to those officials responsible for initiating actions looking toward the construction of water works or sewerage facilities is that section devoted to 'Suggestions for Getting Started.'"

The Indiana "Red Book" which resulted from the stimulus of the "Blueprint Now" movement, was authored by Professors John E. Stoner and Pressly S. Sikes of Indiana University—and Joseph L. Quinn, Jr., Acting Director of the Bureau of Environmental Sanitation, Indiana State Dept. of Health, to whom the authors give credit as being the "main-spring" behind the project.

Water Conservation

The water conservation program inaugurated in 1943 by the War Production Board with the AWWA cooperating was continued in 1944. That there is need for conservation within the water industry itself is indicated by a recent press release in which it is estimated that the 14,500 public water supplies in this country, serving about 84,500,000 people, were needlessly pumping 4 billion gallons of water a day, much of which could be saved. This waste may easily be costing the country well over $170 million for operation alone.

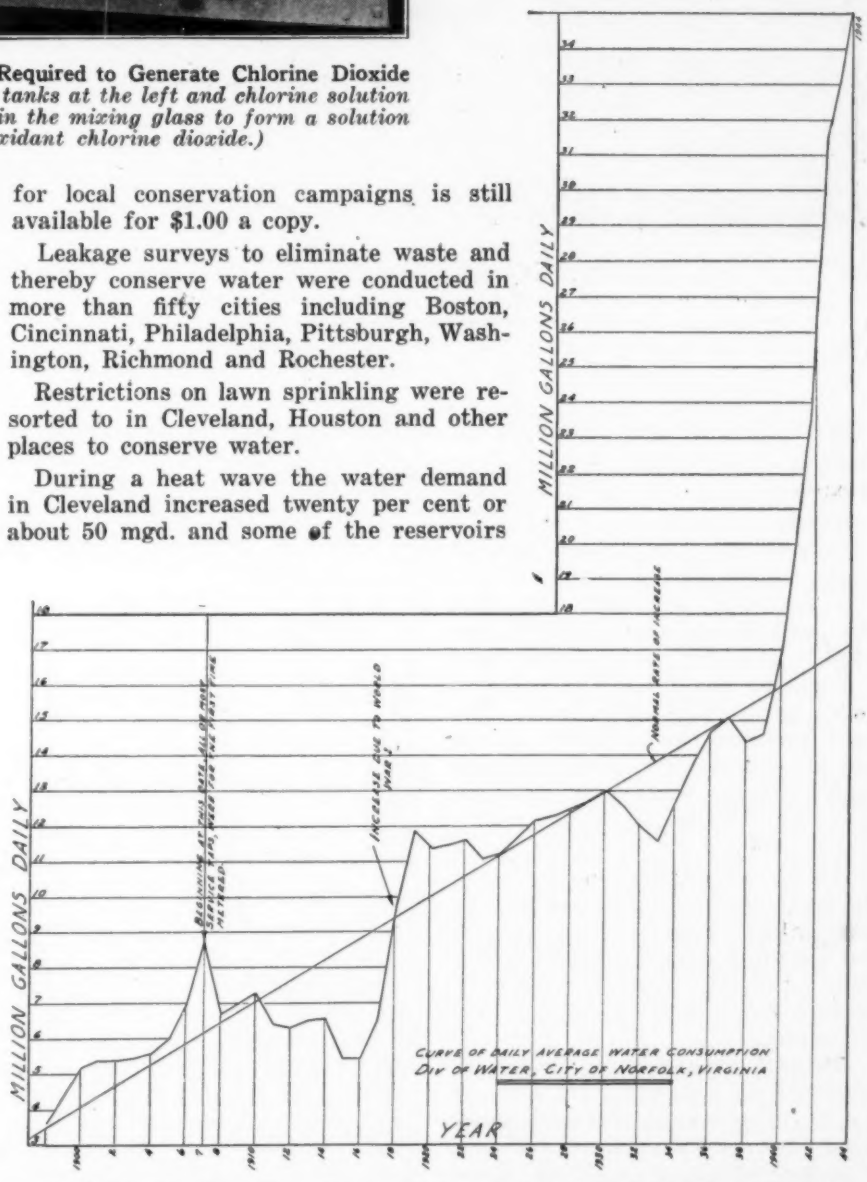
The booklet entitled "Water Conservation" prepared by the AWWA which provides suggestions and material which can be freely copied for local conservation campaigns is still available for $1.00 a copy.

Leakage surveys to eliminate waste and thereby conserve water were conducted in more than fifty cities including Boston, Cincinnati, Philadelphia, Pittsburgh, Washington, Richmond and Rochester.

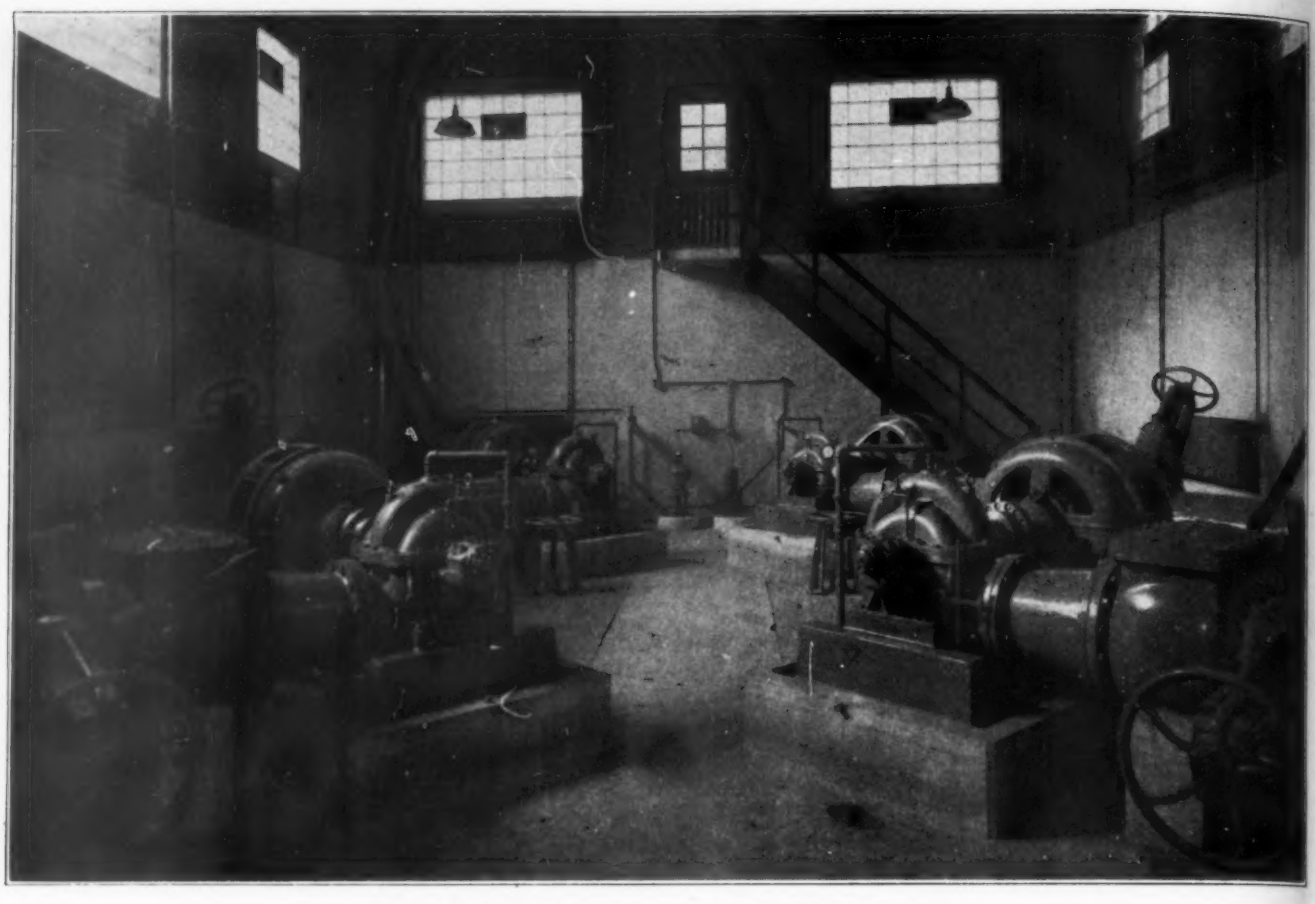
Restrictions on lawn sprinkling were resorted to in Cleveland, Houston and other places to conserve water.

During a heat wave the water demand in Cleveland increased twenty per cent or about 50 mgd. and some of the reservoirs were shut off for part of the day to conserve the supply. The resultant reduction in water pressure, however, threatened to interfere with the operation of some war industries. To meet this situation all sprinkling of lawns, parks and golf courses were stopped for several days. Priorities have been obtained for six electrically-operated pumps costing $750,000 which will be installed before 1945's hot weather arrives.

The war demands placed a very heavy load on the Houston water plant. To reduce the peak loads an ordinance was made effective, which provided that even-numbered premises would be permitted to sprinkle their lawns on the even days of the month and the odd-numbered premises on the odd days


MILLION GALLONS DAILY
MILLION GALLONS DAILY
INCREASE DUE TO WORLD WAR I
NORMAL RATE OF INCREASE
CURVE OF DAILY AVERAGE WATER CONSUMPTION
DIV OF WATER, CITY OF NORFOLK, VIRGINIA
YEAR

Norfolk's Wartime Water Pumpage Record that Caused Sleepless Nights
(Note the minor drop back in consumption following World War I, and compare the increase in demands resulting from World War II as against World War I.)



The New Blackwater River Station—Norfolk, Va.

Typical of a number of rapidly commissioned pumping stations, built to keep pace with the sky-rocketing water demand curve shown on the preceding page. Newport News, Va., and Wilmington, N. C., had parallel problems in providing ample supply, pumping and transmission facilities to meet war demands. Truly a home-front production battle has been won without benefit of "E" flags or citations for America's water supply industry.

between the hours of 8 and 10:30 p. m.

Weather

Damaging floods and excessive run-off in the agricultural central west, and droughts in the industrial northwest and northeast, were the dominant abnormalities of the 1944 water year which ended September 30. Stream flow in the west was frequently subnormal. The year was the third wettest in the north central region from Kansas to Manitoba. From east Texas to northern Florida a similar condition existed.

On an areal basis, annual run-off was excessive in 19 per cent of the United States, deficient in 13 per cent and near normal in 68 per cent. For the country as a whole, stream flow averaged 108 per cent of normal.

Natural ground-water levels, as observed in key wells not affected by heavy pumping, were generally above normal in north-central and Rocky-mountain states, but somewhat below normal in the southern and eastern states during most of the year.

In the San Fernando valley in California, ground-water tables were so high that basements and cesspools were flooded, and drainage wells are to be drilled so the water level may be lowered by pumping.

During the summer, precipitation was freakish. Areas west of the Mississippi, including the great plains states, which are normally relatively dry, received an abundance of rain. East of the Mississippi, where rain is usually plentiful in the summer time, conditions were abnormally dry—particularly in the Ohio valley.

Legal Aspects

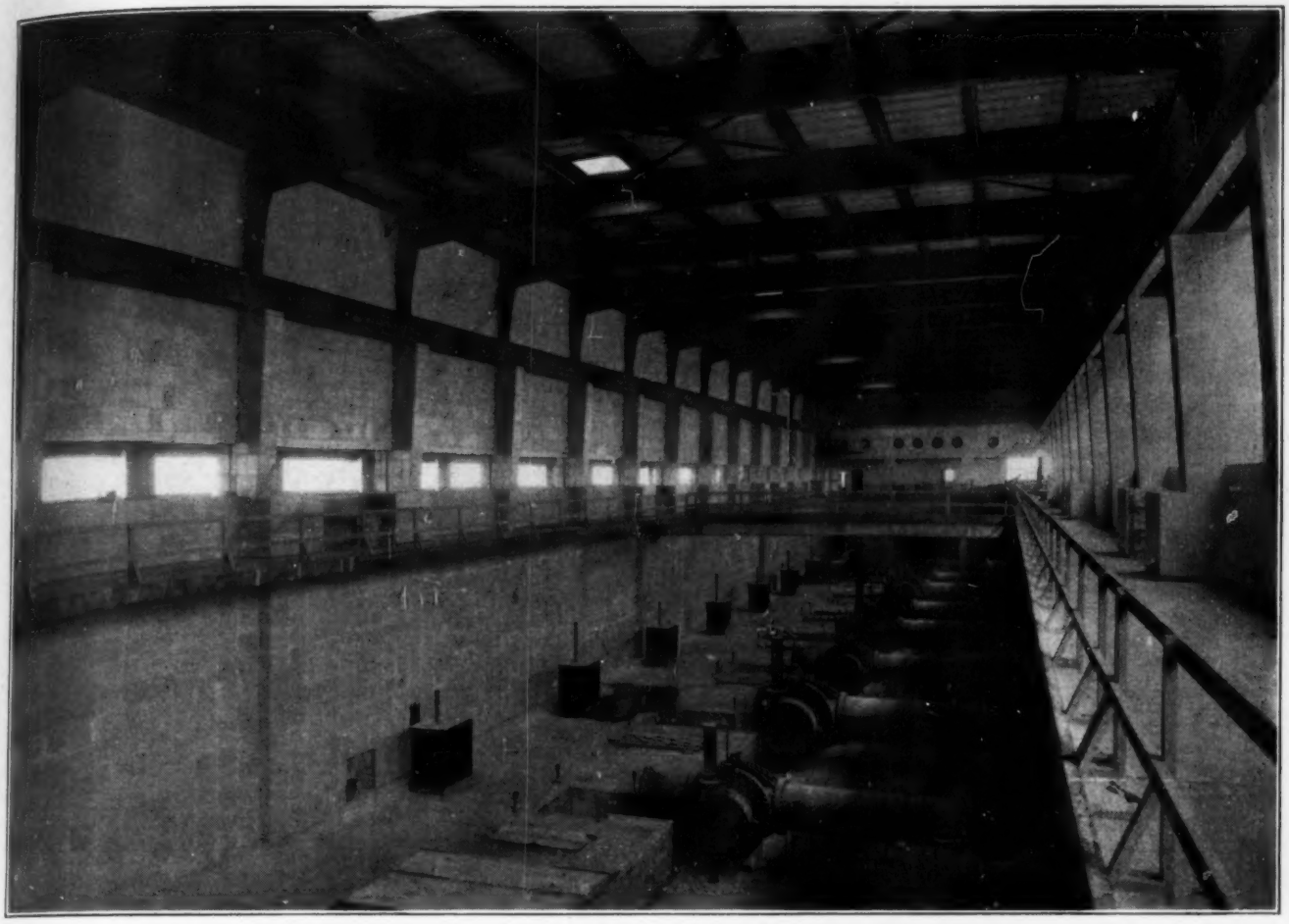
An important decision, involving the application of the Federal Fair Labor Standards Act of 1938 to a water company, was made by the Missouri supreme court. The court ruled that the water company involved was within the exemption of a retail establishment, and also that the activities of the company were too remote from the production of goods for commerce to bring them within the act.

The first round in a legal fight over the United States Treasury's effort to impose federal income taxes on interest of bonds issued by state and political subdivisions thereof was decided in January in favor of the bond holders.

Labor

For the first time in the United States, the U. S. Army took possession of a municipal water department due to labor troubles. In February, the Los Angeles Department of Water and Power was taken over to end a strike of municipal employees that had halted war production in many plants and prevented repair of storm damages to electrical distribution systems. Delivery of the municipal water supply, however, was not affected and apparently the water works employees did not strike.

Employees of the Bureaus of Street Cleaning, Highways and Water went out on strike January 6, and did not return to work until January 23. They demanded a ten-cents per hour increase in wages. Picket lines were established at the distribution yard, and at the garage where equipment is stored, but



Construction of Chicago's South District Filtration Plant Goes Forward
General View of Interior of Pumping Station With Cone Check Valves in Place Waiting for Pumps. (See Front Cover Picture for Artist's Conception of Complete Plant, Which Will Be World's Largest.)

skeleton crews were permitted to operate the pumping stations and treatment plants. The river patrol from the laboratory, and leak survey forces, were not permitted to work and the collection of samples from the distribution system was done under guard. Repairs to broken pipes were only permitted when householders were without water; consequently many leaking pipes and broken fire hydrants went unrepaired. The real reason for the strike was reported to be a fight amongst the heads of the union for control, in an effort to unseat union officials then in office.

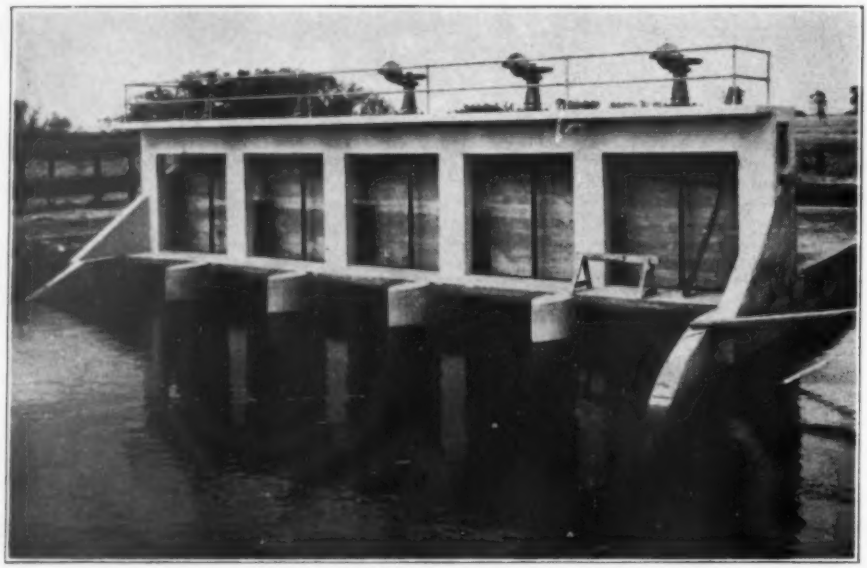
USPHS Drinking Water Standards

The 1942 United States Public Health Service "Public Health Drinking Water Standards," and accompanying "Manual of Recommended Water Sanitation Practice," adopted in Sept. 1942 and made generally available in 1943, were widely discussed by water works and sanitary engineers who criticized some portions of these documents. The American Water Works Association Board of Directors requested, in January, 1944, a reconsideration by the United States Public Health Service of portions of the standards. Subsequently, a meeting was held at which the divergence of viewpoints was outlined. Late in 1944 the USPHS issued a circular letter to state health officers, outlining the policy to be followed in interpretations of the standards in which many of the issues raised are dealt with, but there still remains a question as to whether all the points at issue have been disposed of.

Water Treatment

Chloride Dioxide: A new process for the removal of chlorophenol taste and odor was developed by the Mathieson Alkali Works, Inc. The process consists of pretreatment with chlorine to disinfect the water, followed by treatment with chlorine dioxide to remove taste and odor caused by phenolic waste. The chlorine dioxide is generated by dispensing a sodium chlorite solution into the discharge line of a chlorinator. A constant dosage of 0.5 ppm. available chlorine is maintained, which, it is claimed, is sufficient to remove all taste in a severely contaminated water. This process is claimed to destroy phenolic taste and odor permanently and completely where customary methods of treatment are inadequate. Evidence indicates reduced chemical costs and simplified plant operations. The chlorine dioxide treatment was described in the Dec. 1944 issue of *Water Works and Sewerage*. This new development is now in use at Niagara Falls, Tonawanda, North Tonawanda, and Lockport in New York state, Bangor, Me., and Greenwood, S. C.

Fluoride: In studies of the effects of fluorine on tooth structure, both here and abroad, evidence has been found that a moderate amount of the element reduces decay if it has been ingested during the years of tooth development, while larger amounts cause mottled tooth enamel in children. Persons drinking water containing small amounts of fluorine in a natural state showed only one-third as much tooth decay as comparable groups imbibing water containing none. It still remains to be proved, however, that the mechanical addition of fluorine



Oklahoma City's Intake to Diversion Canal Feeding New Bluff Creek Reservoir

to water containing none of the element will produce the same results.

Practical tests of the theory that tooth decay can be greatly decreased by adding fluorine to the drinking water are to be conducted. The fluorine content in the water at Newburgh, N. Y., is to be increased from its normal content of 0.12 ppm. to 1.0 ppm. for ten years, during which time the five to twelve-year-old children will have dental examinations yearly. For comparison similar examinations will be made of the children in Kingston, N. Y., where the water contains no fluorine. Tests are also to be conducted at Brantford, Ontario.

Diatomaceous Earth Filtration: Diatomite filtration equipment, in which diatomaceous earth is added to the water as a filter-aid, before filtration has been developed by Proportioneers, Inc., for use in the armed forces where high rates of filtration are required. This method of filtration has been used commercially only in small industrial plants and swimming pools, but may project itself further into the field of water purification.

Recovery of Calcium Carbonate: Recovery of calcium carbonate or lime from water-softening sludges has long held the interest of water works men. The art of such recovery has advanced until now it is said that no city can continue to postpone the softening of water on the excuse that it cannot dispose of the sludge. Methods now in use may soon become an integral part of many softening plants. The "secret" of these methods lies first, in selective calcium softening whereby the softening reaction is so controlled that only calcium carbonate is precipitated; and, secondly, the employment of centrifuges to eliminate the water from the sludge before drying and calcining if lime is produced.

Tests for Chlorine: A test for active residual chlorine, and chloramine using sodium arsenite and ortho-tolidine as reagents, was announced by the laboratories of the New York State Department of Health. This test gives no false residual chlorine values with colloidal manganese dioxide present up to 2.5 ppm. Mn., ferric chloride up to 25 ppm. Fe, and sodium nitrite up to a saturated solution.

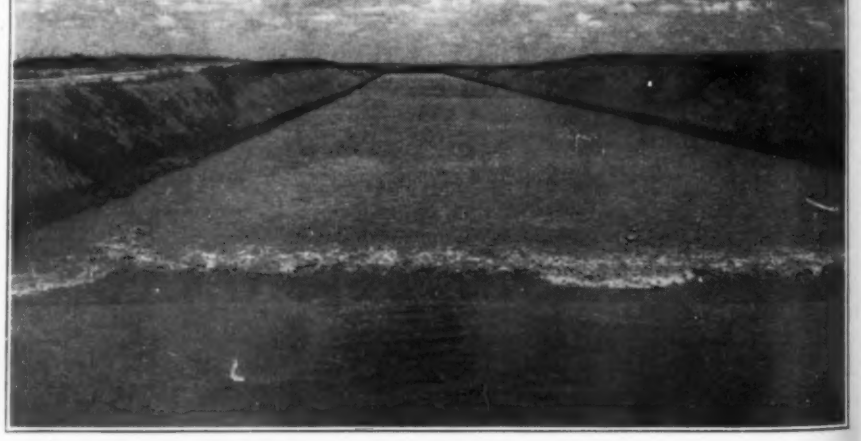
Automatic Residual Chlorine Indicator: The detailed description of an automatic photoelectric residual chlorine indicator and recorder, which is in operation at the Springfield, Ill., water plant, was made generally available in July. Such an instrument serves a very useful purpose in places where there are large and unpredictable variations in the chlorine demand of the raw water.

Air Conditioning

The probable accentuated use of air conditioning equipment in the post-war era, without the recirculation of the cooling water used, is looked upon with alarm by those responsible for the supplying of water. It is pointed out that to have to provide such water, at the time when water is normally being used at a high rate, will tax the resources of most water systems to the utmost. The solution to the problems appears to be the requirement that prospective users of air-conditioning equipment install apparatus for reclaiming the cooling water, thereby lessening the demand, and to refuse to supply water unless such equipment is a part of the installation.

Pipe Reclamation

Large pipes have been cleaned and cement lined, to check tuberculation and corrosion and restore original carrying capacity at many



And, Oklahoma City Will Not Go Dry!
(Through this Diversion Canal Water Flows at Rate of 1500 *Cusecs to Fill Bluff Creek Reservoir.)*

places. The Centreline process was used in 1944 at Boston, Cincinnati, Buffalo, Detroit, Los Angeles, Rochester and Washington. The Tate process also has been used on smaller size pipe in many localities.

Elevated Storage

Government regulations restricted the building of elevated steel water tanks for municipal service and, in some places, booster pumps with suction storage were substituted. There also were instances of tanks being moved from one location to another as, for example, Jackson, Miss., purchased a used tank from Springfield, Ill.

Electrodless cathodic protection for steel tanks has made its appearance and appears satisfactory. Further fundamental studies on cathodic protection were made. (Ed. note: the first of three articles on these studies referred to appears in this issue.)

Construction

Much of the construction in 1944 of water facilities was a continuation of projects started some time before or additions and extensions to existing equipment. Of most interest are the following items:

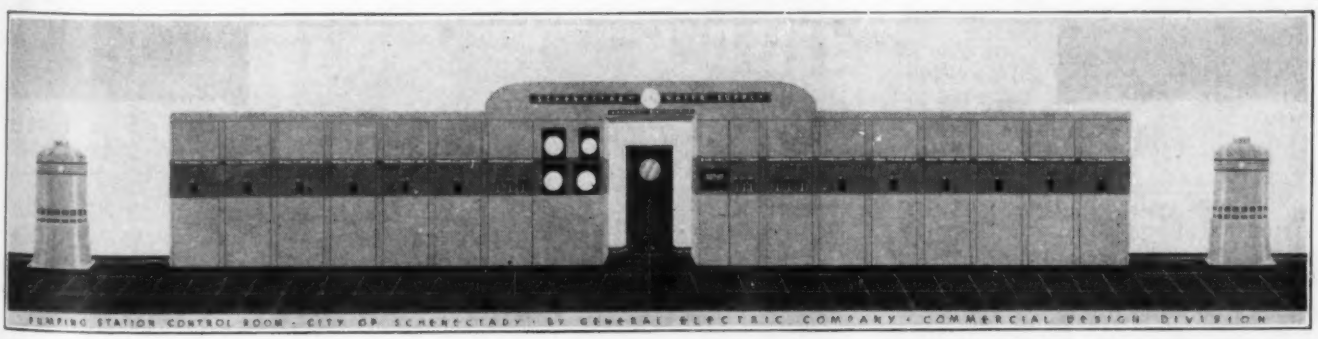
Chicago's South District Filtration Plant, construction of which was started in 1938 but which was impeded by wartime restrictions on material, is now 70 per cent completed. When completed this $24,000,000 project will have a maximum capacity of 600 million gallons daily and will serve 54 per cent of the city's area. The plant is scheduled for completion in 1946 if materials are available, but it is expected that early in 1945 the equipment required to chlorinate, coagulate and settle the water will be placed in service. This temporary operation will provide a 70 per cent improvement in the quality of water served to 1,350,000 persons.

And, Wilmington, N. C., Wont Go Dry Either!

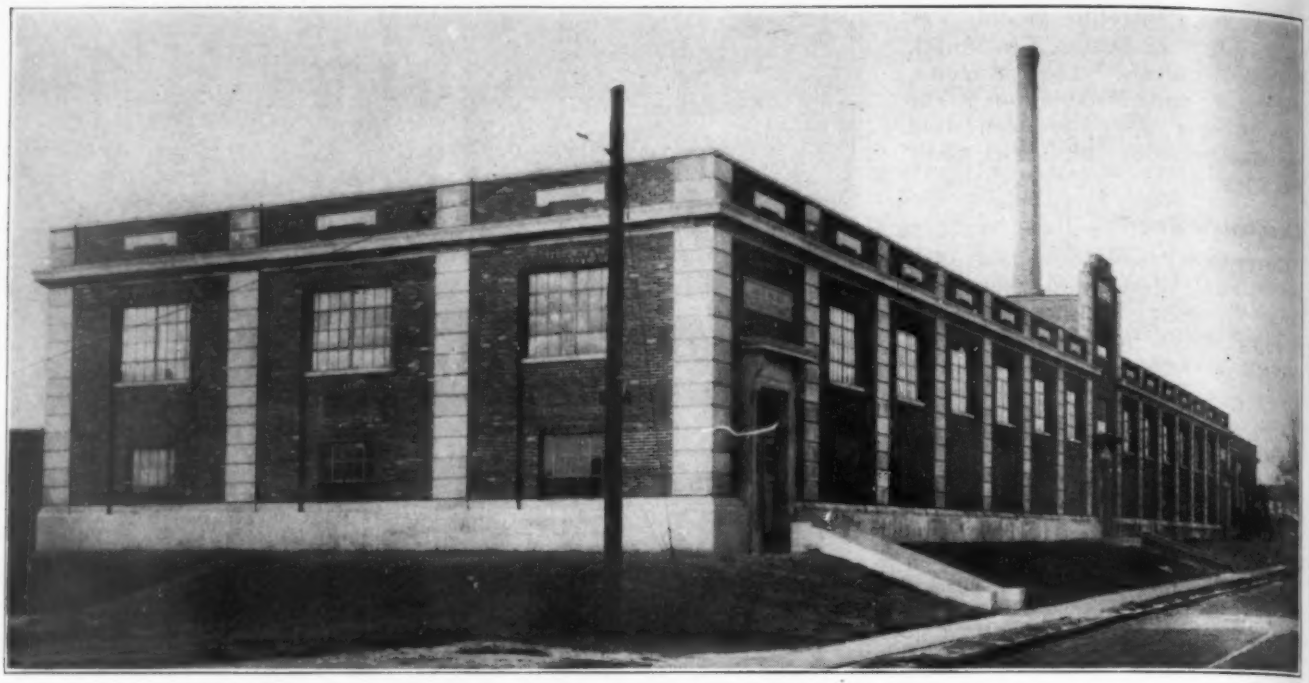
(A Stretch of Wilmington's New Supply Line of Lock-Joint Concrete Pipe Wins the Battle Against Salt Water Incursions as Well as That of Ample Supply to the New Filtration Plant.)

Temporary operation of a portion of the new Delaware water system for the city of New York (construction of which started in 1937), began April 5, 1944, at which time a temporary tunnel connecting the river bed below the site of Merriman dam on Rondout creek was joined to a shaft of the aqueduct, thereby diverting the stream flow of about 75 million gallons daily to the city. The main portion of the aqueduct has been completed for its entire length of 85 miles, but governmental restrictions have made it impossible to obtain much of the operating equipment. Consequently, temporary emergency equipment has been installed permitting a limited use of the aqueduct.

Work on the Rondout and Neversink developments is now suspended and probably will not be resumed until after the cessation of hostilities. A supply of 100 million gallons daily will be available from Rondout creek about four years after the resumption of construction and 70 million gallons daily from the Neversink development two years later, thus completing



Pumping Station Control Panel in Schenectady's Modernized Plant



37th St. Filtration Plant at Norfolk, Va.
(Was Doubled in Size to 24 M.G.D. Capacity and Soon Overloaded Again.)

the first stage of the Delaware water supply system.

The Brighton reservoir of the Washington Suburban Sanitary Commission on the Patuxent river above Laurel, Md., capacity 6.5 billion gallons, was placed in service in July to relieve water shortages in Prince Georges county. The reservoir stores water until needed to augment the river flow when it is released into the river channel.

Oklahoma City's Bluff Creek water supply reservoir (capacity 75,000 acre feet) located four miles northwest of the city, will store water diverted by gravity through a 5½-mile canal from the North Canadian river. Work on this project, which was started in 1941, was completed in February. The first water was diverted in March. The treatment plant and pumping station to be used in connection with this supply has not yet been constructed on account of inability to secure the necessary material, but the 48-inch supply line to the distribution system has been constructed.

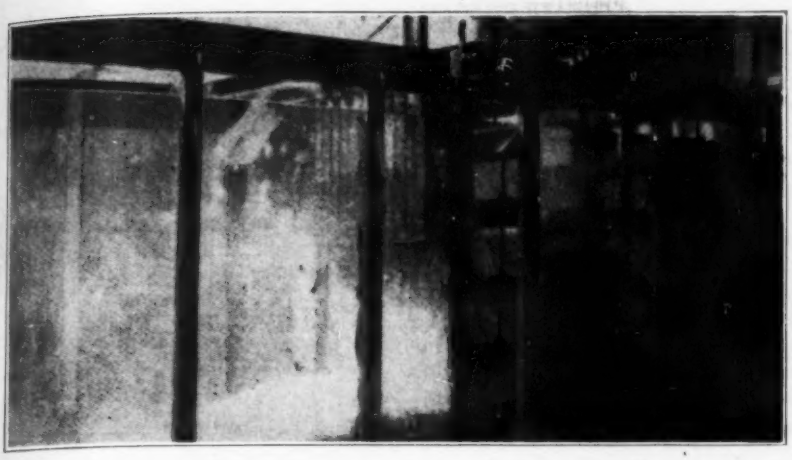
The Tulsa, Okla., water supply expansion, which was started in 1942, was completed in August. This improvement provides a 67 per cent increase in filtration capacity to 40 mgd. It involved the construction of a new mixing chamber, an additional coagulation basin, extension to filter building and four new rapid sand filters for the treatment of the water; the installation of two high-lift pumps, one new and one used, for the pumping of the water, and several miles of large pipes for the distribution of the water.

Schenectady's new plant, started in 1942, was placed in service on January 21 just in time to prevent a shortage. On the day the entire water load was furnished by the new plant, and the old plant was closed, there were but 3 mil. gal. of water stored in the 20 mil-gal. Bevis Hill reservoir.

At Des Moines, a pumping station housing two 10 mgd. pumps and 3,300 feet of discharge pipe to a reservoir site have been constructed. The dam for a 4,800-acre-ft. reservoir is now being built and, when completed, water pumped from the Raccoon river will be stored in it and released to augment stream flow as the occasion arises.

In Wilmington, No. Car., where the supply of potable water at

Operating Floor, New Wilmington, N. C., Filter Plant



Working Model of Stuart Flocculator and Venturi Distributor.

Flocculator in Action on Right.

times was limited and the salt content of the delivered water sometimes was as high as 2,400 ppm. or about one-tenth that of sea water, a new supply was developed. This project involved the construction of a 21-mile, 30-inch concrete pipe line and a 7-mgd. treatment plant and pumping station at a total cost of $2,340,000.

The Decatur, Ill., water system was remodeled to meet increased industrial demands by the construction of a low-lift pumping station, the rebuilding of mixing basin, clarifier basin and lime house, the installation of two softening units, and the construction of miscellaneous arterial feeder pipes 16 to 20 inches in diameter.

The Jackson, Miss., water treatment plant was converted into a modern plant of increased capacity, without interrupting service. This conversion consisted of changing one of the existing settling basins into a mixing chamber and flocculation basin, installing additional filters and constructing a new settling basin and reservoir. Cast-iron pipes were also installed to expand the distribution system.

The Mosquito Creek reservoir, storing 16 billion gallons, has been completed and placed in service for supply to the Mahoning valley industrial area.

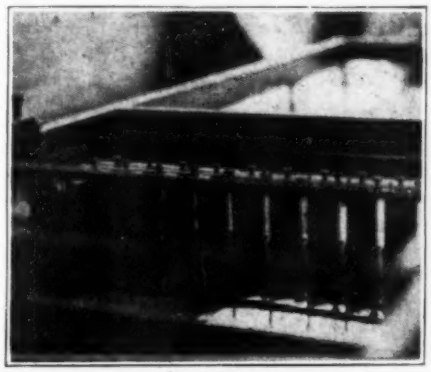
Millville, N. J., has made alterations to its treatment plant and installed prestressed circular concrete coagulating basins. This may be the first instance in which prestressed tanks have been used for this purpose.

Lima, Ohio, has increased its supply by the addition of a billion gallon raw water storage reservoir of the up-ground type and the installation of additional filters, and settling tanks.

Galesburg, Ill., added to its supply by the construction of a 2,400-ft. well, an elevated tank of reinforced concrete and a 2½-mile supply line.

Knoxville, Iowa, added a 1½ mil. gal. ground storage reservoir and a booster pumping station.

Fort Worth, Tex., installed two concrete storage reservoirs with



Stuart's Adjustable Venture Thoat Distributing Wall
(Above Water Section)

connecting pipe about six miles from the main pumping plant. One of 5 mil. gal. capacity is in the southern part of the city and the other, of 4½ mil. gal., is in the northern part.

Dallas, Tex., made extensive improvements by relocating a standpipe, increasing the pumping capacity and installing about 20 miles of distribution pipe, 8 to 36 inches in size.

Corpus Christi, Tex., installed three additional pumps, constructed a settling basin and spent $200,000 strengthening the distribution system.

Longview, Wash., constructed a filtration plant for treating water from the Cowlitz river, and laid a pipe line to a reservoir previously constructed. This replaced a former ground-water supply and obsolete filtration plant.

Seneca Falls, N. Y., installed a new filtration plant on Lake Cayuga, about five miles from the village, and constructed a pipe line to the distribution system.

Lewisburg, Tenn., has constructed a pumping station, nine-mile supply line and filtration plant for waters from Duck River.

East Point, Ga., is now supplied through a new filtration plant and a nine-mile supply line.

By lifting water 500 feet with two booster lifts, Gadsden, Ala., is supplying a high level section recently annexed to the city.

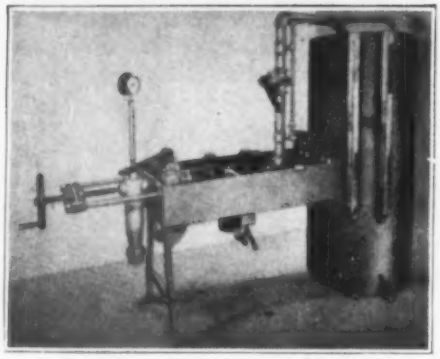
A new filter plant has been constructed at Mobile, Ala., a new well field has been developed at Montgomery, Ala., and at Phenix City, Ala., the existing treatment plant has been rehabilitated and additional facilities added.

Kingsport, Tenn., Knoxville, Tenn., and Columbus, Tenn., have enlarged their treatment plants, and Columbia, Ga., has started construction of a 9 mgd. addition to the filtration plant. At least one city, McCayesville, Ga., has a complete new water system consisting of a distribution system supplied by gravity from a spring.

Last, but not least of the 1944 construction, one may cite reinforcements requiring large diameter pipe at Hanford, Wash., Miami, Fla., Miami Beach, Fla., Seattle, Wash., and Kearny, N. J.

Equipment News

Water works equipment manufacturers have been devoting their major efforts to manufacturing munitions of war, with the result that little new water works equipment has been placed on the market. There have been some developments, however, a few of the more important of which are briefly



Pittsburg Meter's Meter Prover

referred to in the following paragraphs:

Perhaps the most interesting, unique, and important are two developments of Stuart-Brumley Co., and Ralph B. Carter Co. The first of these is a new type flocculating device operating on a principle different from any previous devices. Tiers of inverted trough paddles, suspended from ends of walking beams, move up and down, creating a motion necessary to good flocculation. All driving parts are outside the basin and there are no underwater bearings, chains or moving drives.

The second of these developments is a new type of baffle known as the adjustable venturi distributing baffle. This new baffle, which distributes flow evenly and causes the deposition of floc at a greater distance from the baffle wall than is usually the case, is being installed at Norfolk, Va.

Builders-Providence, Inc., have developed a new propeller-type flow meter for main water line metering, which introduces many new features, including stream-lined Venturi design to create a more uniform velocity distribution where the flow meets the propeller. Builders has also developed a portable Hook Light Sand expansion gage for determining the sand expansion during the back flushing of filters, and a flushing water indicator designed as a guide in maintaining normal flushing rates to meters measuring the flow of liquids containing settleable solids.

Dresser Manufacturing Co. reintroduced their Style 85 Bellmaster Joint which had been discontinued until the exigencies of war would permit pipe manufacturers to furnish the special pipe needed. This is a mechanical joint, consisting of a resilient, rubber-compound gasket compressed by cap screws between two malleable rings.

F. B. Leopold Co. marketed a compound duplex filter bottom composed of salt glazed, vitrified clay, perforated blocks which provide equal filtration over entire area of filter bed and insure equal distribution of the wash water.

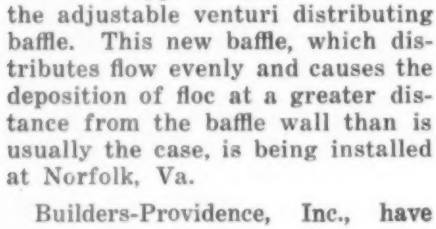
Clayton Manufacturing Co. developed a pump control valve for surge protection for centrifugal pumps and pipe lines, a non-surge valve to eliminate starting surge in water lines from well pumps, and a back flow protection unit to prevent flow of water from non-potable sources.

The Ford Meter Box Co. is manufacturing meter testing tanks with asbestos-cement pipe, designed for use when the water is so aggressive that the life of the usual galvanized steel tank is relatively short.

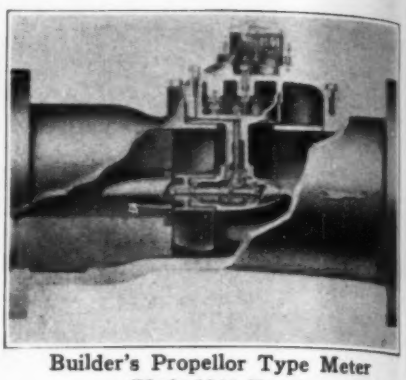
The Homelite Corp. started production of a new portable centrifugal pump with aluminum cylinder and piston and a magneto with all ignition parts quickly and easily accessible.

The Industrial Interconnector Co., Inc., marketed the Sure-Shift Interconnector which makes water available immediately and automatically from a standby source, without the possibility of contaminating either source from the other regardless of relative pressures.

Chemical Engineering Corp. announced a product for destroying moss and slime in plant reservoirs, cooling plants and spray ponds. This process is named Chenco Kil-Mos Water treatment.



Neptune's Rate Indicator
(Improves Meter Testing)



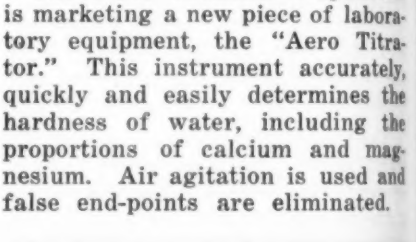
Builder's Propellor Type Meter
(Made 1944 News)

Northrop & Co., Inc., introduced a new self-calking, sulphur base compound known as "Bond-O," for jointing cast iron, bell and spigot pipe.

Quigley Company, Inc., announces a newcomer to their line of protective coatings—Copper Naphthenate Preservative, to control or eliminate dry rot, fungi and molds in wood.

The Economy Manufacturing Co. has an automatic water sample collector, which collects and refrigerates samples obtained at time intervals uniformly spaced throughout the day.

The Chief Chemical Corporation is marketing a new piece of laboratory equipment, the "Aero Titrator." This instrument accurately, quickly and easily determines the hardness of water, including the proportions of calcium and magnesium. Air agitation is used and false end-points are eliminated.



The Aero-Titrator for Hardness Determinations

CATHODIC PROTECTION OF STEEL SURFACES IN CONTACT WITH WATER

A Discussion of Basic Principles and Controlling Phenomena

By LEE P. SUDRABIN
Chemical Engineer
ELECTRO RUST-PROOFING CORP.
DAYTON, OHIO

THE establishment of the most satisfactory method, for mitigating the corrosion of steel surfaces in contact with natural waters[1] in the pH range of 4.5 to 10.0, has been a challenge to all engineers who design and operate steel structures such as clarifiers, filters, water storage and heating tanks which come in contact with this environment. The method selected for retarding the wastage of metal by corrosion is usually based on any one or a combination of the following procedures: (1) use of protective coating; (2) the adaptation of metals and alloys which resist the corrosion environment encountered; (3) chemical treatment of the water to make it less aggressive; (4) cathodic protection, which subdues galvanic corrosion electrically.

In the water works field, cathodic protection as a method of corrosion control is a relative newcomer, the first application to water storage tanks probably being made in 1936.* Since that time cathodic protection has established itself, when properly applied, as being a practical method of protecting submerged steel surfaces.

What Cathodic Protection Is

In the simplest sense, cathodic protection consists of stifling the flow of current which accompanies electrochemical corrosion by projecting a current flow through the corroding media to the metal where it becomes superimposed on the metal surface to be protected.

This definition conforms with that given by earlier research workers in the field of corrosion, and its thought will be developed throughout this paper.

When compared with other methods of corrosion control, properly understood and properly applied, cathodic protection has advantages which justify its consideration as the solution of many corrosion problems.

(a) In many cases installations can be made and placed in operation without taking the equipment to be protected out of service. This is of particular importance in water tanks used for fire protection, water systems where there is only one head tank or in other equipment where an outage would interfere with production.

(b) Surfaces to be protected do not require special preparation. Old paint films and most scale and corrosion products actually reduce current density requirements for complete protection.

This eliminates the necessity of sand blasting, flame cleaning or wire brushing to remove the old coating and corrosion debris, drying of the exposed surface and providing adequate setting time for a protective coating before contact with the water, in order to obtain a satisfactory protection for underwater surfaces.

(c) The use of an adequate current density to take care of the cathodic processes on the surfaces exposed to the corroding media, will give complete protection by maintaining protecting effect continuously on the metal surface. This may be compared with the development of failure in most protective coatings which become focal points of accelerated corrosion, resulting in deep pits before a new covering can be applied.

(d) Cathodic protection requires very little maintenance and supervisory attention.

(e) Cathodic protection can be economically justified when compared with other methods of underwater corrosion control.

(f) The chemical nature of the bulk of the water is not altered by cathodic protection.

The Author

Before becoming associated with Electro Rust - Proofing Corp. Mr. Sudrabin was in the employ of an important midwestern power company. His familiarity with the cathodic process in corrosion control came about as a successful user of the method.

During the past several months in his present position Mr. Sudrabin has been engaged in research and field studies of cathodic protection. The author is therefore well grounded in this subject, and this article constitutes the first of three which he is contributing to "Water Works and Sewerage."

Mr. Sudrabin's next article will deal with practical applications and cost data on cathodic protection. His third article will be devoted to the process as it is applied to hot water systems. Then, in due time, experiences with the process in the protection of sewage works equipment will be presented.

Background

The idea of cathodic protection is not all new, since Sir Humphry Davy[2] in 1824 observed that a metal "—if it could be rendered slightly negative, the corroding action of sea water upon it would be null—" and he "—thought of using a voltaic battery—" to supply the current flow to the metal surface.

Practical limitations of the voltaic cells in those days prevented Davy from using them as a means of motivating current flow to large surfaces to be protected; however, he did attach zinc plates to these metal surfaces and protected them by the flow of current generated by the potential difference in the zinc-metal couple. The zinc plates were not ef-

*"*A New Method of Tank Protection"—O. B. Hess, Sup't of Water, St. Clairsville, Ohio, (W. W. & S., Nov., 1938) is seemingly the earliest published report on cathodic protection applied to water tanks.*

fective over large areas. The most complete protection occurred adjacent to the zinc and rapidly diminished in effectiveness as the distance from the zinc was increased.

Around 1912 Cumberland[3] in England and in the early 1920's Kirkaldy[4] in the United States, made use of direct current for corrosion control and the prevention of scale and formation in surface condensers and boilers. In his application of cathodic protection Cumberland installed anodes of iron mounted on insulated supports in the water boxes of the condenser. By means of direct current from a dynamo he caused current flow from the iron anodes through the sea water to the surfaces to be protected.

The Kirkaldy System was similar to the Cumberland System and was based on the idea that any metal which was made sufficiently cathodic to eliminate all local voltaic or galvanic couples, would neither corrode nor permit scale to develop.

Within the last two decades cathodic protection[5] has been used for underground pipe line corrosion control and has probably attained its greatest commercial application in this field, particularly in the petroleum and natural gas industries.

Although the art of cathodic protection is quite old, its practical application has until recent years outdistanced the fundamental engineering data available for design. In order to properly design a cathodic protection installation it is necessary to thoroughly understand the corrosion mechanism itself, the factors in the corrosion environment which govern current density requirements, the fundamentals of electrode materials and design, the economic considerations involved in the initial and operating costs, sources of potential for motivating current flow to the submerged metal surfaces and hazards of the improper use of electric current. These are only a few of the considerations involved in the engineering design of a cathodic protection installation for a particular corrosion problem and indicate that this work should be done only by engineers experienced in the application of cathodic protection.

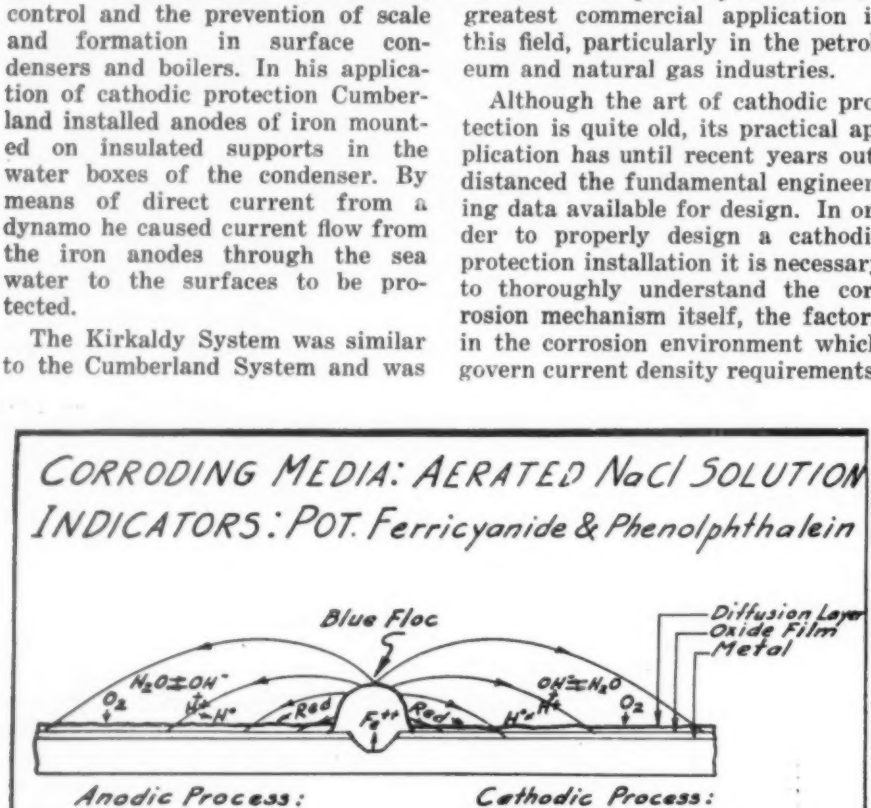


Fig. 1 (A & B)—Schematic Illustration of Chemical Reactions at the Face of a Freely Corroding Surface and One Which Is Receiving Cathodic Protection

Corrosion Mechanism:

In order to visualize the manner in which a current flow through the corroding media (water) to a steel surface will protect the metal, the mechanism of electrochemical corrosion should be considered and particularly the factors governing the rate of corrosion.

The localized type of attack illustrated by the development of pits on freely corroding steel surfaces exposed to aerated natural waters, Fig. 2, has been shown to be related to the flow of current resulting from differences in the tendency for the metal to enter the solution in contact with it. Non-uniformities of the metal surface or of the solution in contact with the metal can cause these differences in potential. In practice (1) differential thermal treatment, (2) localized failures of the protective oxide film, (3) differential concentration or nature of the corroding media, (4) differential aeration and (5) dissimilar metals generally determine the location and intensity of the corrosion current[6].

The electrochemical theory of corrosion proposed in 1903 by W. R. Whitney[7] has become the basic concept of most corrosion phenomena in electrolytes. He associated corrosion with the flow of electricity resulting from the loss of two electrons by each iron atom leaving the crystal lattice of the metal and entering the solution as a ferrous ion at the anodic or most electronegative areas on the metal surface.

$$[Fe^{\circ} - 2e \rightarrow Fe^{++}]$$

This equation pictures the solid metal going into the soluble state involving ionization.

At the cathodic or less electronegative areas, the electrons (e) released by this process are accepted by an equivalent number of hydrogen ions at the metal-solution intergen ions at the metal-solution interdrogen atoms. By reducing the hydrogen ions to hydrogen atoms at the more cathodic areas the hy-

droxyl ions, which result from the dissociation of water, concentrate there and increase the pH.

(1) $2H_2O \rightleftarrows 2H^+ + 2OH^-$

(2) $2H^+ + 2e \rightarrow 2H^\circ$

This process if undisturbed develops sufficient counter potential (polarization) on the cathodic areas in airfree neutral waters, which will stifle further deposition of hydrogen ions and in turn retard solution of metal at the anodic areas.

This mechanism can be illustrated by observing the surface of a steel plate Fig. 1A submerged in a quiescent distilled water solution containing sodium chloride and a modified "ferroxyl indicator" solution. The "ferroxyl indicator" solution consists of potassium ferricyanide and phenolphthalein.

The *anodic* process is shown by the formation of a blue floc (Prussian Blue) resulting from the reaction of the ferrous ion and the potassium ferricyanide. This blue floc is essentially the corrosion product (rust) forming when the pitting action is taking place. The amount of tuberculation or rust, which is much more voluminous than metal from which it was formed, is equivalent to the iron atoms which have left the metal structure and entered the corroding media in the form of ferrous iron (Fe^{++}).

The *cathodic* processes occurring over most of the metal surface are shown by the development of red color with the phenolphthalein indicator. No blue floc is found on these areas, indicating that there is no loss of metal at such points.

Thus the freely corroding metal surface in contact with the corroding media may be pictured as consisting of many irregular shaped and spottily distributed areas at which metal wastage is occurring, while the remainder of the surface is free of attack. The flow of current from the local anodic areas through the corroding media is essentially supplying a degree of natural cathodic protection to the rest of the exposed surface. The magnitude of the corrosion current and in turn an equivalent amount of metal wastage at the local anodic areas, is governed by the rate of depolarization occurring on the cathodic surfaces.

Unfortunately in the case of iron and most other metals, there are processes and acceptors (depolarizers) for the electrons released by the anodic process which do not permit the more cathodic areas to polarize to the open circuit potential of the anodic areas. Hadley[8] has enumerated five cathodic processes which may govern the rate of electrochemical corrosion. The first three are well known and may be observed to varying degrees in natural waters.

1. Combination with dissolved oxygen.
   [$H\text{-}OH + \frac{1}{2}O_2 + 2e \rightarrow 2OH^-$]
2. Depolarization by agitation or bubbling off of hydrogen.
   [$2H^+ + 2e \rightarrow 2H^\circ \rightarrow H_2$]
3. Direct chemical combination with the electrolyte or salts, for example the reduction of ferric ions to ferrous ions.
   [$2Fe^{+++} + 2e \rightarrow 2Fe^{++}$]
4. By entering into the metabolic processes of certain anaerobic bacteria.
5. Combination with the products of microbiological metabolic processes.

The last two methods mainly occur in airfree soils and waters. Fig. 3 was developed by Wilson[1] in 1923 to indicate the relative influence on the corrosion rate of iron by the pH and dissolved oxygen concentration of the water.

From this it is evident that the corrosion rate in natural waters is governed mainly by the dissolved oxygen depolarization process, although it is known that the hydro-

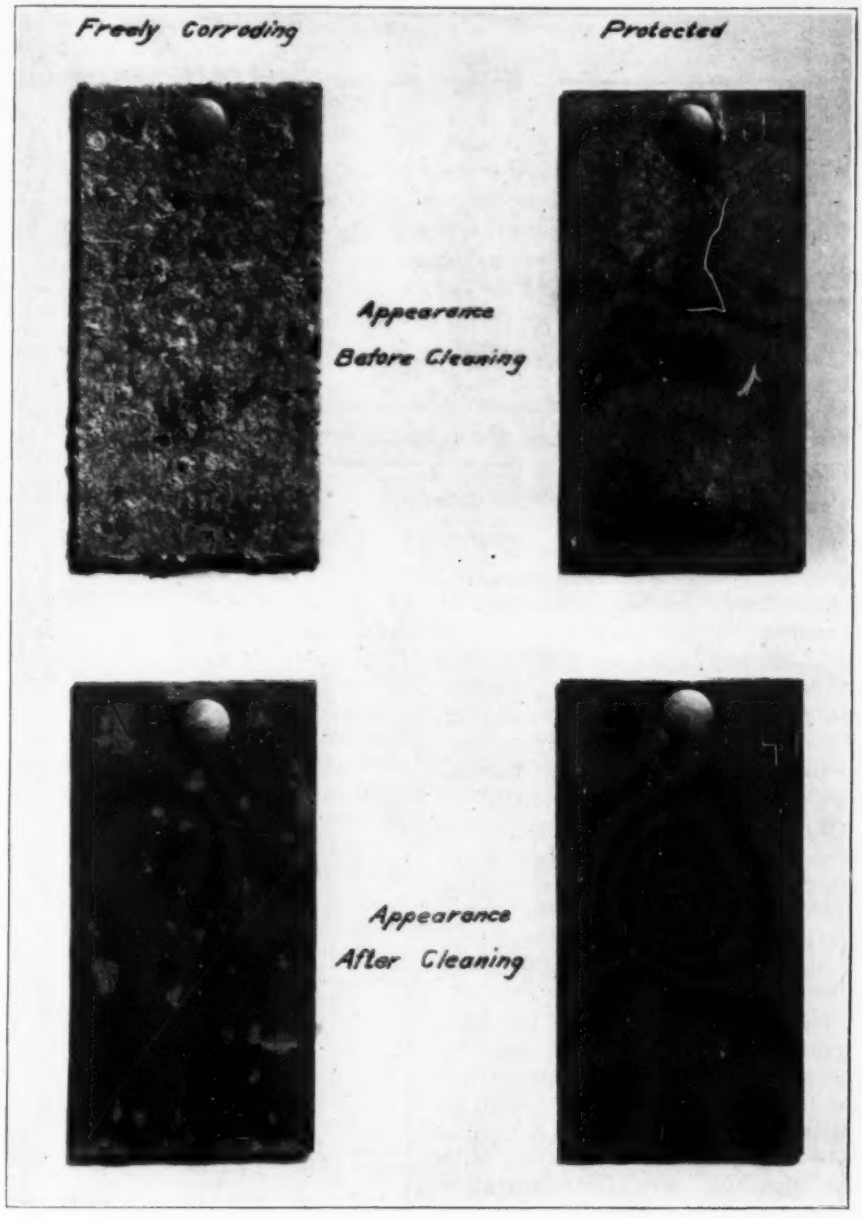


Fig. 2—Freely Corroding and Cathodically Protected Test Specimens from a Dorr Clarifier

(Left—Freely corroding pieces before and after cleaning; right—protected pieces before and after cleaning. Note chalky deposit on plate J before cleaning. Note pit marks on plate N after corrosion products seen on plate G had been removed.)

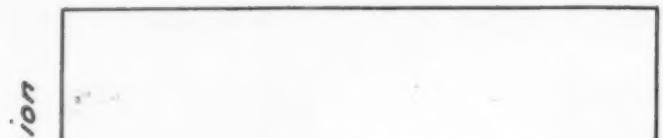


Fig. 3—Effect of pH on the Corrosion Rate of Iron at High and Low Dissolved Oxygen Content of the Water.—(Wilson 1923).

gen evolution process occurs simultaneously.

For all practical purposes the rate of corrosion represented by hydrogen evolution is not significant in the absence of dissolved oxygen until the pH is less than 5.0 at normal temperatures.

When the acidity of the electrolyte drops below pH 5.0, the hydrogen ion pressure is sufficient to overcome the hydrogen overvoltage at the metal surface and cause marked evolution of hydrogen gas. This is the acid type of attack.

To further illustrate the key part that dissolved oxygen (O_2) plays in the rate of corrosion in neutral waters[10], it has been noted that with all other conditions equal the corrosion rate of iron increases linearly with the dissolved oxygen concentration up to 5.5 c.c. per liter.

Current Density Requirements:

Although an excessive current density will not prove to be harmful to iron as it does to the more amphoteric metals such as aluminum[11], the cost of the original installation and of operation dictate that the minimum current density requirements be established for complete protection against the corrosion environment being encountered.

Current density requirements for any corrosion problem have been generally chosen on a "rule of thumb" basis, which the worker may feel is adequate for a specific type of problem. Davy[2] indirectly established the minimum current density requirements for the protection of copper against sea water by observing that the ratio of copper to zinc must be less than 150 to 1 to obtain complete protection.

An examination of the literature on cathodic protection indicated current density requirements ranging from 0.3 to 60 mille amperes per sq. ft. for the protection of iron against various water solutions. Generally very little thought has been given to the factors which may cause this wide variation in current density requirements.

Clement and Walter[12] in some of the first fundamental work done on cathodic protection, established two conditions affecting the c.d. requirements for the protection of steel against $N/100 H_2SO_4$.

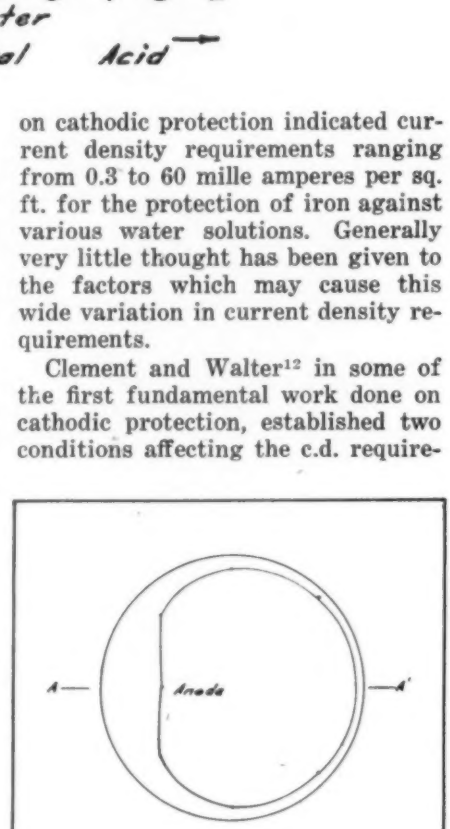


Fig. 4—Results of a Current Density Distribution Study Revealing Facts Contrary to Expectancy.

First, they observed that the current density requirements increase with increasing dissolved oxygen concentration.

Secondly, with all other conditions being equal, increasing the stirring increases the current density requirements.

These observations may be visualized more readily if we consider the presence of a stagnant layer of solution existing at the metal surface. This stagnant layer, Fig. 1A and B, acts as a barrier to the diffusion of dissolved oxygen from the bulk of the water to the metal surface. If we increase the dissolved oxygen concentration in the water, we increase the number of oxygen molecules reaching the metal surface. By increasing the temperature or the velocity of the corroding media next to the metal surface, we reduce the effective thickness of the diffusion layer and increase the rate of oxygen diffusion.

Since the rate at which dissolved oxygen reaches the cathodic areas through the diffusion layer governs the rate of metal wastage in natural waters, we can see that the superimposed current from an auxiliary anode, Fig. 1B, required to retard the rate of corrosion at the natural anodes will also be influenced by the dissolved oxygen concentration and the factors controlling the effective thickness of the diffusion layer.

Work done by the writer has indictated that, in quasistagnant corrosion media of water containing less than 1.0 ppm. of dissolved solids, 0.1 N and 1 N NaCl solutions, with controlled oxygen concentration in the bulk of the media, the current density requirements for complete protection vary directly with the dissolved oxygen concentration and is relatively independent of the salt concentration.

The Effects of Calcium and Magnesium Salts

The degree of lime saturation of the natural water markedly affects the current density requirements for metal protection. A high degree of lime saturation in a water, as shown by the Langelier Saturation Index, inhibits the corrosion process. This is true because the smallest natural corrosion current develops sufficient alkalinity on the cathodic areas to precipitate a deposit of $CaCO_3$ from this water, increasing the effective thickness of the diffusion barrier and in turn reducing the amount of oxygen reaching the cathodically ac-

tive points on the submerged metal surface. However, the saturation of a water with calcium carbonate and a pH of 10.3, such as that found in the water in contact with the freely corroding specimen, Fig. 2, should not be relied upon alone to completely stifle the corrosion process in the presence of appreciable amounts of dissolved oxygen.

The ordered reduction of the hydrogen ions and the migration of the cations such as Ca^{++}, Mg^{++} and Na^{+} to the protected cathode surface when projected current is applied, produces a highly alkaline film at the metal surface which is indicated by the red color developing when the "ferroxyl indicator" is used, Fig 1B. The calcium bicarbonate $Ca(HCO_3)_2$ and/or magnesium ions in the bulk of the water coming in contact with the highly alkaline solution developed at the boundary of the diffusion layer precipitates calcium carbonate ($CaCO_3$) and/or Mg $(OH)_2$ at the metal surface. This often appears as a chalky coating on a protected metal surface. [Note uncleaned protected specimen, Fig. 2.]

Even waters with very little Ca $(HCO_3)_2$ and magnesium ion will deposit a $CaCO_3$ and/or $Mg.(OH)_2$ film providing the current density being applied produces a sufficiently high alkalinity at the metal surface.

From the foregoing it should not be assumed that cathodic protection is *entirely* dependent on the presence of calcium and magnesium salts in the water for effectiveness. The writer has protected steel surfaces immersed in aerated water containing less than 1.0 ppm. of dissolved solids. Clement and Walker[12] and U. R. Evans[13] have protected steel cathodically against dilute acid solutions. The advantage of calcium and magnesium salts in water is that the current density requirements for complete protection are lower in their presence and consequently make for greater economy of process.

The Effect of Protective Coatings

Paint and asphaltic coatings, even though they may be in a very poor condition, will reduce current density requirements since they are effective diffusion barriers and by the electrical resistance of their films concentrate the flow of current to points of film failure where the metal is exposed. Experience in the application of cathodic protection to underground pipelines has shown that the condition of the protective coating markedly influences the current density requirements.

Since the natural corrosion current is governed by the depolarization rates occurring on the more cathodic areas of the steel, the projection of an applied current from a submerged auxiliary anode to the metal surface will reduce the current leaving the local anodic areas on the steel. Increasing the applied current reduces the local current flow until the "protective current density" is reached, at which point all local corrosion currents have been stifled. It has been observed in 1N salt solutions that the potential of the steel does not change until the "protective current density" is reached, since the freely corroding steel surface potential is governed by that of the cathodic areas and the actual current density flowing to the cathodic areas has not been altered up to this point. Instead of supplying the current from the local anodes on the metal surface it is now supplied from the auxiliary anode in the corroding media, Fig. 1B. Above the "protective current density" the potential[14] of the specimen behaves similarly to a hydrogen electrode. Ewing has shown that a measurement of the metal potential alone is not a criteria of protection.

M. DeKay Thompson[9] has observed that the degree of protection of steel surfaces in NaCl and Na_2SO_4 solutions by an applied current is directly proportional to the current density applied up to the "protective current density." This suggests that the use of insufficient amounts of applied current for *complete* protection are still of benefit since it will tend to reduce the local corrosion currents in any event. He also observed that in the same environment the current densities required to protect cast iron as against steels, did not differ markedly.

It should not be assumed from the foregoing that the required current density for protection is just equivalent to the natural corrosion current represented by the metal wastage. There are many factors which do not permit this assumption to be valid. One of these may be visualized if we consider the cathodic areas in natural corrosion to repre-

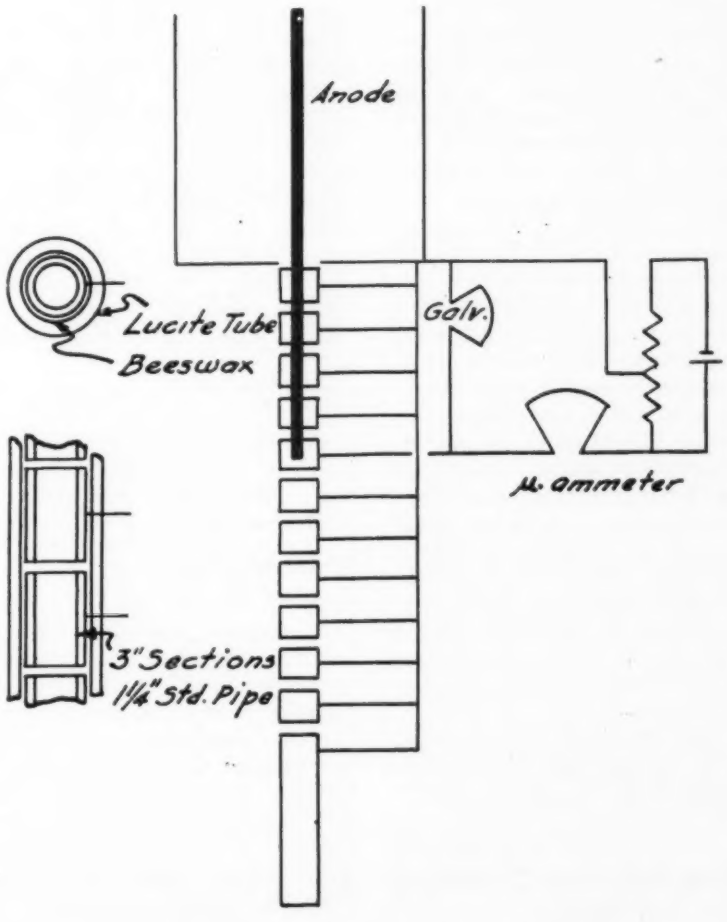


Fig. 5—Experimental Arrangement in a Study of Current Density Distribution in Tubes and Elevated Tank Risers

sent only a portion of the exposed surface. When an applied current is used some of it flows to the areas which were anodes in normal corrosion. Often it is the case that many times the natural corrosion current must be applied from the auxiliary anodes to completely stifle the corrosion process.

Anode Design:

The criteria of good anode design is the proper distribution of the current density, long anode life and the establishment of a low resistance through the corroding media between the anode configuration and the surfaces to be protected. It may be thought that the centering of an anode in a water tank with a flat bottom would provide a uniform current density to all surfaces which are equidistant from the anode. In the slightly more complex case of an eccentrically placed anode in a steel cylinder with a conducting floor (see Fig. 4), the current density distribution determined experimentally by the writer does not substantiate this thought. [The current density distribution was obtained by a probe technique developed by the writer.* Also, this probe technique has been employed to study the current distribution over the surfaces of complex structures from an operating cathodic protection installation, such as a Dorr Clarifier mechanism.]

In order to picture the distribution of current in condenser and boiler tubes, pipes or in elevated tank risers, a test assembly (Fig. 5) was constructed of sections of pipe insulated from one another. Conductors led from each section were grounded to the tank which represented the water box of a condenser, drum of a boiler or bowl of an elevated tank. The current density on any section could be determined by dividing the current measured flowing to the section in question, by the surface area of the section. Table I illustrates the current density flowing to each section from a centered 3/16-in. diameter electrode extending to the bottom of the fifth section using a 5 per cent NaCl as the electrolyte. (See Fig. 5.)

*Reported on in a recent paper presented by the author to the Fifth Annual Water Conf. of the Engineers' Soc. of Western Pennsylvania, October, 1944.—Ed.

TABLE I

Section	Current Density (Average)
1	4.3 micro amps/sq. cm.
2	4.0 "
3	4.5 "
4	4.0 "
5*	4.0 "
6	0.5 "
7	0.2 "
8	0.0 "

*Anode terminated in Section 5.

These data indicate that the current distribution extends only a short distance from the end of an electrode within a cylinder. From this it may be concluded that the anode design should be made to properly distribute current without any reliance on the so-called "throwing power" of the current input.

The ideal anode material would be one which resists deterioration when current flows from its surface, is inexpensive, does not introduce deleterious products into the electrolyte, is mechanically strong, has a low resistance and may be fabricated in sizes and shapes required to conform to the conditions encountered. There is no perfect anode material for all problems and the conditions found in the application will dictate the material used. Amongst the materials generally considered are carbon, graphite, mild steel, chrome and stainless steels, duriron, aluminum, zincs, copper, platinum, gold, etc.

The theoretical volumes and weights which will be lost by metals per ampere year of current flow are revealed in Table II. In the case of graphite the mechanical loss due to sloughing off of the particles of graphite are often much greater than the electro-chemical values would indicate.

Water Quality and Current Density

A paradox found in the application of cathodic protection is the observation that for waters of high resistance (low solids content), higher current densities are usually required than for waters of low resistance. The implication of this thought may be gathered when we compare midwestern waters with a specific resistance of 1200 ohms per cm. cubed with that found along the eastern seaboard, whose specific resistance is often 20 times as great. For the same tank and electrode arrangement, 20 times the power consumption would be required to supply the same current to the eastern tank. A reduction in power consumption can be accomplished only by altering the "cell constant" of the electrode-tank configuration. This can be done by increasing the number and altering the spacing of the electrodes and/or increasing the ratio of the anode diameter to the tank diameter. For an anode centered in a cylinder[15], the effect of the ratio of the anode to tank diameters upon the resistance, may be predicted from the following relationship.

$$\text{Resist.} = \frac{2.303}{2\pi} r \log_{10}\left[\frac{R_1}{R_2}\right]$$

r sp. resistance
R_1 Anode diameter
R_2 Cylinder diameter

TABLE II
Electrochemical Equivalents of Anodes

Anode	Sp. Grav.	Lbs./Amp. Year	Cu. in./Amp.Yr.
Iron	7.86	20.1	71.0
Graphite	2.26	2.2	27.0
Zinc	7.14	23.5	91.4
Nickel	8.90	21.3	66.5
Aluminum	2.702	6.4	65.7

Bibliography

1. Wilson, Md. and Eng. Chem. 15, 127, 1923.
2. Davy, H., Phil. Trans. Roy. Soc. (London) 114, 151, 1824.
3. Cumberland, E., Engineering, 101, 313, 1916.
4. Kirkaldy, A., Marine Shipping Age, 29, 289, 1924.
5. Rhodes, T., Monograph Am. Gas Assoc., 1935.
6. Mears and Brown, Md. and Eng. Chem., 33, 1001-10, 1941.
7. Whitney, W. R., Jour. Am. Chem. Soc., 25, 394, 1903.
8. Hadley, R. F., Am. Gas Asso. Proc., 764-88, 1940.
9. Thompson, M. DeKay, Trans. Electrochem. Soc., 69, 155-67, 1936.
10. Cox and Roethell, Md. and Eng. Chem., 23, 1012-16, 1931.
11. Mears and Fahrney, Trans. Am. Inst. Chem. Engrs., 37, 911, 1941.
12. Clement and Walker, U. S. Dept. of Interior, Bu. of Mines, Tech. Bul. No. 15, 1913.
13. Evans and Stockdale, Metals and Alloys, 1, 377, 1930.
14. Ewing, S., Am. Gas Assoc. Proc., 613, 1940.
15. Jeans, J. N., "The Mathematical Theory of Electricity and Magnetism," 350-63, Cambridge Univ. Press (Eng.), 1925.
16. McKinney, D. S., Trans. Electrochem. Soc., 75, 31-6, 1939.

Post War Planning Continues to Climb

Sewerage Advances 4 to 1 Over Water Betterments During Month

During the month of November plans for post-war construction of water works climbed $45,601,000 to $336,573,000, while plans for sewerage construction increased $193,710,000 to $729,683,000, according to the summary issued by the ASCE Committee on Post-war Construction. Director Mark Owen of that committee has changed the format of the monthly report and now presents the information in a well-tabulated form from which it is easy to note the monthly changes in each category as well as in each state.

CALIFORNIA SECTION HOLDS SILVER ANNIVERSARY MEETING

WITHOUT any especial emphasis on the fact, the 683 member California Section of AWWA, held its Silver Anniversary Meeting in Los Angeles, October 24-26, 1944. The registration of 927

Chairmen

(Retiring)
Burton S. Grant, Engineer, Dep't of Water, Los Angeles

(Incoming)
C. P. Harnish, Exec. Vice Pres., So. Calif. Water Co., Los Angeles

exceeded that of the 1943 meeting but established no new attendance record since three meetings have gone above the 1,000 mark in attendance.

Technical sessions were held on the 25th and 26th, and the first day was given over to a golf tournament in the forenoon and a trip in the afternoon by special train to the plant of the Consolidated Steel Corp. at Wilmington, Calif.

Purification Division Dinner

The Annual Dinner of the Purification Division was staged the first evening. Speakers for the occasion were Professor Chas. Gilman Hyde, who this year retires from his long held professorship in Sanitary Engineering at the Univ. of California, and Major Rolf Eliassen, of the U. S. Corps of Engineers, recently transferred from New York to Fort Douglas, Utah.

Prof. Hyde gave one of his customarily masterful addresses, packed with praise for those who have made names for themselves in water purification, and filled with inspiration for those who are following in the path of the mighty in Sanitary Engineering and the Sanitary Sciences. His topic was "Water Purification—Some Reminiscences."

And the program committee knew well how to pick speakers when it selected Rolf Eliassen as the second after-dinner speaker. In his informal recounting of "Some Interesting Observations in Army Water Supply Practices," the young Major was at his best. He told of many problems in water supply for Army posts and how these were solved many times through marked ingenuity of those in charge. A high spot in his entertaining as well as informative discourse was the story of the automatic water-hammer relief on a wood-stave pipe line. Whenever a surge would occur it was necessary to go out and re-plug the knot-holes where knots had earlier been, only to be picked up in the field after being shot out by the water hammer. This was only one problem of many created by substitution of wood and other materials for metal in water supply construction.

Officers Elected

The following were elected to office or re-elected for the year ensuing.

Chairman
C. P. Harnish, Vice Pres., Southern Calif. Water Co., Los Angeles.

Director Elect
Ray F. Goudey, Chief San. Engr., Dep't of Water, Los Angeles

Pres. A.W.W.A.
Sam'l F. Newkirk, Jr., Water Board, Elizabeth, N. J.

Vice-Chairman
Carl M. Hoskinson, Chief Engr. and Acting Supt., Division of Water, Sacramento.

Secretary-Treasurer
Blair I. Burnson, Engr., East Bay Util. Distr., Oakland.

*National Director, A. W. W. A.**
Ray F. Goudey, Chief San. Engr., Dept. of Water and Power, Los Angeles.

The new Purification Division officers are as follows:

Chairman
Harry Hayes, Asst. San. Engr., Dept. of Water and Power, Los Angeles.

Vice-Chairman
H. C. Medberry, Chief Purif. Engr., Water Dept., San Francisco.

Secretary-Treasurer
John R. Rossum, San. Engr., Calif. Water Service Co., San Jose.

(*For 3-year term beginning with close of 1945 A. W. W. A. Convention and succeeding John S. Longwell of Oakland.)

Vice-Chmn.
Carl M. Hoskinson, Engr. & Supt., Div. of Water, Sacramento

Secy.-Treas.
Blair I. Burnson, Engineer, E. Bay Util. Dist., Oakland

Fuller Award to Sopp

The George W. Fuller Award was voted to Geo. C. Sopp, Supt. of Meters and Service, Los Angeles Water Dept., in recognition of his work in restoring warped and worn water meter discs, resulting in sizable savings in meter repair and maintenance expense.

Pres. Newkirk and Col. Putnam Dinner Speakers

At the Annual Business Dinner on the second evening the principal speakers were "Sam" Newkirk, President of AWWA, and Col. Rufus Putnam, U. S. Corps of Engineers, Los Angeles.

President Newkirk in reviewing AWWA Activities" covered essentially the ground covered a few days earlier at the Southwest Section Meeting as reported on page 414 of our December issue. Interspersed through his report on the "State of the AWWA," Sam II told some clever suspense stories from which the Californians got a kick. (We dub him Sam II because he follows California's own Sam Morris as president, and of course he's Sam I.)

Colonel Putnam was highly interesting in his telling of "Late Developments in U. S. Army Water Supply Methods at Home and Overseas." He stated that of the 191 water supply installations within his command area, 116 obtained supply from existing water works. Where the supply contains more than 400 ppm. hardness, softening is pro-

vided; more than 3 ppm. iron, iron removal is provided. Maintaining residual chlorine of 0.4 ppm is mandatory for water on the posts. As to demand, 150 gpcd. is assumed for posts and 50 gpcd. for troops in the field. Concerning overseas, a Water Supply Battalion consists of 500 officers and men with 9 purification trucks of 90 gpm. capacity. In addition there are many portable filter plants of 15 gpm. capacity. For the larger liquid chlorine is used, for the smaller hypochlorite is used. For the first waves of landing troops distillation units are employed. For more permanent troops well drilling outfits are provided. Canvas tanks of 3,000 gal. capacity have proved highly practical and useful. We regret that we cannot cover more of the experiences in providing water supply which Colonel Putnam recounted.

Programmers

W. E. Shaw, San. Engr., State Dept. Hlth., Berkeley, Calif. — *Fred D. Pyle, Hydr. Engr., Water Dept., San Diego, Calif.* — *Robt. C. Kennedy, Asst. Chief, E. Bay Util. Dist., Oakland, Calif.* — *Wm. J. O'Connell, W.J.O. Technical Consultants, San Francisco* — *J. M. Montgomery, J. M. M. & Co., Cons. Engrs., Los Angeles* — *L. E. Blakeley, Consulting Engineer, Santa Ana, Calif.* — *H. A. Harris, Jr., Engr. of Design, Cal. Water Co., San Jose, Calif.*

U. S. Drinking Water Standards

The technical sessions opened with a symposium on the new U. S. P. H. S. Drinking Water Standards. Discussing the matter of **"Applying the Revised Drinking Water Standards,"** Admiral J. K. Hoskins, Asst. Surgeon General and Chief of the Sanitary Engineering Div. of the U. S. Public Health Service, presented a clean cut, forthright statement covering the meaning of the several parts of the revised standards which have been causing apprehension on the part of water utility managers and the AWWA. Putting it briefly, Mr. Hoskins pointed out that like all previous U. S. Drinking Water Standards, the 1942 revision is not set up as a strict engineering specification, nor is it to be considered such. In previous revisions nobody got hurt through the application of the Standards and interpretation had always been allowed the State Health Departments in applying the standards and recommending for or against supply certification. Under the new Standards the same recognition and confidence is being extended to State Sanitary Engineers and the policies of the U. S. Public Health Service had not been changed from that of earlier years in this matter. Obviously the Standards had been developed so as to obtain a safe water at the consumer's tap since the Standards apply to the product (water) rather than to the producer or purveyor. The obvious intent, admittedly, is to stimulate elimination of possible pollution through cross-connections and/or back-flow. To attain this end would require the cooperative efforts of water purveyor, health authority, building or plumbing department and perhaps others. Certainly the consumer had a right to expect this protection. As to the legal side, Mr. Hoskins thought it extremely remote that a water purveyor could be held liable for damages due to cross connections within buildings over which he has no control.

All in all it appears that the revised 1942 Standards were developed with the idea of having them serve as objectives. As to their interpretation, continued reliance would be placed on the State Health Authorities for this important aspect and on their recommendation as to acceptance of the individual supply for certification and use on public carriers.

Mr. Hoskins reminded his audience and those most critical of the 1942 Standards that the Public Health Service sought practical guidance in the revision of the 1925 Standards and to this end relied to a major degree on an Advisory Board which was composed of representatives chosen by all National associations and agencies having an interest in water supply and water quality. This Board of authorities and experts put their signatures of approval to the final draft of the new Standards. Thus it is that the 1942 Standards represent the composite production of water supply experts of the Nation and the U. S. Public Health Service after many months of study and deliberation and numerous revisions to meet objections and recommendations from members of the Advisory Board. Mr. Hoskins again emphasized the fact that "rigid and automatic application" of U.S.P.H.S. Standards for Drinking Water has never existed nor should such be the case now, the greatest dependence being placed on the State Health Agencies in their interpretation and reports recommending certification or non-certification of each individual water supply rated by such State agency. (See Circular Letter No. 85 Surgeon General U.S.P.H.S. to State Health Departments.)

Touching on the "Manual of Recommended Water Sanitation Practice," Mr. Hoskins stated that this "guide" to inspecting and reporting agencies should not be construed as anything more than a guide, since it was entirely apart from the Standards. While the Manual might have been issued as a completely separate document, it had been printed under the same cover with the Standards principally for the convenience of the user, and because of its relationship to the actual Standards. Unfortunately many have apparently assumed an association of the two documents of much closer relationship than had been intended. Admittedly the Manual was far less perfect than desired but its production with the guidance of the Advisory Board was thought to constitute a step in the right direction with opportunity to perfect this document through as many revisions of this "guide" as change and progress might dictate.

Fair minded listeners were of the opinion that Admiral Hoskins had made a splendid case for the revised U. S. Drinking Water Standards,

Dinner Speakers

Prof. Chas. G. Hyde (Retired) Univ. Calif. Berkeley

Maj. R. Eliassen Repairs & Util. Div. U. S. Engrs. Fort Douglas, Utah

and more especially for the democratic procedures pursued by the Public Health Service in their development and the avowed policies to be followed in applying these Standards.

Because of the nation-wide import of this matter we have devoted considerable space to Admiral Hoskins' statement—so much so that we must confine our reporting of other papers in this session to a few words.

C. G. Gillespie, Chief Engr., Calif. State Dept. Health, in discussing the new Standards from the standpoint of the State Health Dept. as the reporting agency, pointed out the markedly increased man hours to be required on water supply certification under the new Standards. Without increased personnel in the Department many water supplies not requiring certification would suffer neglect—perhaps costly neglect. Their interest was in the equitable attention to all California supplies without regard to use on public carriers necessarily. Furthermore, Mr. Gillespie stated that they preferred to continue to use California experience and California judgment in evaluating California supplies rather than a rigid Federal formula or standard. In his interpretation the revised U. S. Standards definitely places more responsibility on the water utility manager, whether rightly or otherwise.

R. F. Goudey, Chief San. Engr., Dept. of Water, Los Angeles, spoke from the water works operator's point of view in discussing the new Standards. He felt that a greater responsibility had been thrust upon the water operator, but that the water manager as a rule felt this responsibility in any event and held a far greater interest in assuring a safe supply to his consumers than any Federal or State Agency possibly could have. He felt that these agencies could do a better job of curtailing pollution of the supply coming to the municipalities, thus adding materially to the certainty of meeting the Standards. He was of the opinion that the new bacterial standards in general, and frequency and wider distribution of sampling on the system was an advance and a justified revision. However, the finding of the coli-aerogenes group was far from being a reliable criterion, unless interpreted with judgment. For instance, organisms of the coliform group will actually multiply in closed conduits between source of supply and the consumer at certain times. Mr. Goudey suggested a less tricky bacterial standard established as the MUST of the Standards, and in addition a "desirability Standard." He was very strong in his idea that the bacterial standard was in need of careful study by a thoroughly qualified committee and subject to revision on a practical basis of known operating results and evident lack of significance of certain coliform organisms as now identified with existing laboratory classifying procedures. Much chaos and confusion now existed in present-day laboratory procedures in respect to coliform group identification or significance of types. The outcome has been excessive chlorination and this without complete correction, for the desideratum of maintaining residual chlorine throughout the piping system had not proved practical of attainment with known methods. To eliminate hazardous cross connections

Honored

Samuel B. Morris and H. A. Van Norman The first being successor to the latter as $25,000-a-year Chief Engr. and Genl.. Mgr. of the world's largest municipal water and power system, that of Los Angeles. After 41 years of service Van Norman turns over his responsibilities to another pair of amply broad shoulders.

and back-flow from plumbing fixtures the water utility manager needed all possible cooperation and assistance obtainable from Federal and State and local agencies.

Mr. Goudey felt that superintendents should accept the new Standards and try to meet them, but that what is needed is a set of "National Standards" for drinking water developed by the water supply profession as a counter document to the

Conf. "Wheelhorses"

Jas. R. Barker Vice-Pres. Neptune Meters San Francisco (Exhibits Mgr.)

H. Arthur Price Engineer Dept. of Water Los Angeles (Dir. Arrangem'ts)

"Federal Standards" which are based on ideals and goals sought, rather than on practical attainment considerations as the base.

Influence of War on Water Facilities

"The Influence of War on Design and Operation of Water Facilities for San Diego" by Fred D. Pyle, Hydraulic Engr., Water Dept., San Diego, Calif.

Mr. Pyle told how $7,000,000 had been or would have to be spent in all by San Diego to insure a water supply to meet war and future demands. The bulk of it went into development of a new supply reservoir and transmission mains, while $1,500,000 went into distribution mains, booster pump stations and added filtration capacity. The next step is to bring in some of the Colorado River water. Between 1941 and 1944, with an increased population by 100,000, water demands shot up from 34 mgd to 55 mgd. Overloading of the filter plant resulted in sand entering the system and damaging meters and flushometer valves. With some bypassing of the filter-plant algae control became a greater problem and chlorination had to be upped and more carefully maintained. He told of the installation of the new electrically charged screens in front of reservoir intakes to keep fish from entering the supply lines.

"The Prevention of Pipe Line Corrosion" by W. R. Schneider, Asst. Engr., Pacific Gas and Elec. Co., Oakland, Calif.

In this paper Mr. Schneider discussed cathodic protection and some of the basic factors to consider in engineering this type of electrical suppression of corrosion created by galvanic action taking place on buried or submerged pipe-lines. His treatment of the subject was too involved for the brevity of this digest. In answer to questions he said that well casings are being

cathodically protected, but the period is too short for proper evaluation of the method which involves a circle of electrodes (ground rods) driven 200 ft. distant from the well.

[The matter of engineering cathodic protection doesn't appear half so simple as one might think from just reading about it, and good protective coatings continue to be a must in effective economical electrical protection. Of course this type of protection applies only to the exterior of the pipe, and there is still the equally or more important job to be done on the interior.—Ed.]

"The Rehabilitation of Water Wells" by Loren E. Blakeley, Consulting Engr., Santa Ana, Calif.

well yield is brought up by perforating the lower casing in place with the Moss Hydraulic Perforator which cuts horizontal louver openings around the casing. This procedure had raised well yields up to 200 per cent at a 34 ft. draw down. In another instance an increase from 600 gpm to 1800 gpm at 25 ft. draw down resulted in a $1300 per year power saving, representing a 5 per cent return on the cost of the complete salvage job.

Mr. Blakeley emphasized the wisdom of careful pump selection to fit the specific yield and characteristic curve of the well in order to avoid possible over-pumpage and collapse of the casing, this being the

nese-steel wire of 0.14 in. diameter spaced 4 inches between strands. The dense leak-tight concrete is secured by vibration during pouring and the wire puts it under compression in excess of the weight of the water. The smaller units have dome roofs while those in excess of 93 ft. diameter have flat roofs.

"Trends in Licensing Professional and Sub-professional Waterworks Employees and Unionization" by Wm. J. O'Connell Jr., Technical Consultant, San Francisco, Calif.

Mr. O'Connell presented a painstakingly prepared comment on the situation of licensing and unionization of waterworks employees, and with it did some interesting philoso-

G. T. Luippold, Mgr. G.T.L. Eng'r'g Sales Co. Los Angeles and J. J. Jessup Cons. Engineer Los Angeles

Don Harway "Water Works & Sewerage" Los Angeles and Larry E. Huck, Mgr. Clayton Valve & Mfg. Co. Alhambra, Calif.

R. W. Sparling, Pres. Sparling Meters Los Angeles and Mrs. Sparling (Ladies' Committee)

Douglas Stromsoe, V.P. So. Pipe & Casing Co. Azusa, Calif. and Duncan A. Blackburn Engr., Dept. of Water Pasadena, Calif.

Joe Swanson, Supt. Dept. Water & Sewerage Sierra Madre, Calif. and J. E. Cleminson Supt. of Water El Monte, Calif.

Mr. Blakeley's extremely interesting paper revealed concern in California over the growing practice of disposal of chemical and citrus wastes into seepage pits or wells. The practice constitutes a serious hazard to ground water supplies in California as the same practice has in Florida. Crenothrix continued to be the chief biological contamination, but the corrective had been chlorination applied deep in the well where the strainers and surrounding sand or gravel are reached by the chlorine. New and rehabilitated wells are sterilized by filling the casing with a hypochlorite solution containing 3 per cent available chlorine and surging thoroughly. Mud drilling is in disfavor because of the contamination and difficulty of effectively sterilizing the finished well.

Mr. Blakeley described the most improved methods of salvage and rehabilitation of deep wells in which casing failures had occurred. After exploration with a miniature camera lowered on a cord, the proper tools are selected for swedging out the collapsed or buckled section and a smaller diameter liner is inserted to span the damaged section, the longest span so far installed being 74 ft. to save a $16,000 well. Other salvage jobs were described also. The most common cause of casing collapse.

Pre-stressed Concrete Tank Experience

"Design and Construction of Pre-stressed Concrete Tanks" by Robert C. Kennedy, Asst. Chief Engr. and Gen'l Manager, East Bay Utilities Distr., Oakland, Calif.

Mr. Kennedy related experience in the East Bay District with 12 distribution storage tanks of prestressed concrete construction of the Hewett design. The advantages of this type of concrete construction were the low amounts of concrete and steel required, water-tightness of structure, architecturally attractive structures involving minimum of maintenance and corrosion-proof. Also these structures resist shock such as from an earthquake. As to comparative costs, the initial cost exceeds that of steel tanks of equal capacities in the smaller sizes especially. For the 200,000 gal. tank the cost was highest ($43,049 per mil. gal.) and for the three 3 mil. gal. units the lowest ($22,956 per mil. gal.). Five one to one and a half mil. gal. tanks cost $30,336 per mil. gal.

Mr. Kennedy described the design and construction of these Hewett patent pre-stressed tanks involving wire winding with 65,000 lb. manga-

phizing. He found that the older men of professional rank abhorred unionization, whereas the younger men look to it as a way out of low compensation and political maneuvering. However, to date the politician has done a better job than management has in influencing employees. Waterworks men are confused and need more enlightenment.

"Cross-Connection Control and Elimination" by W. E. Shaw, Regional Adviser, Bureau of Sanitary Engineering, Calif. Dept. of Health, Berkeley.

Mr. Shaw reviewed the California requirements on cross-connections since February, 1930, and up to the August, 1943, regulations as the latest revision. Under present regulations approved double check valves are accepted, with testing required every 90 days. Distinctive markings or painting of polluted water lines is required, and a water supply supervisor is likewise a requisite. In buildings inadequate size piping must be replaced to avoid creating a partial vacuum at times of heavy draft. At sewage plants no cross connection of any sort is permissible.

In reply to a question, Mr. Shaw would not venture an opinion on what was upper size limit for a safe check valve without more evidence.

The newer devices appeared to be meritorious.

"Methods Employed in Distribution System Flow Analysis" by Chas. J. Itter, Design Engineer, Dept. of Water and Power, Los Angeles.

Mr. Itter's illustrated talk revealed the methods employed in the Los Angeles water system for maintaining a continuing week to week record of flow conditions within the system, reservoir changes, pressure variations. These records are kept on letter size sheets and constantly referred to for designing immediate improvements to the system, as well as advance designs and planning.

Maj. Rolf Eliassen
U. S. Engineers
Fort Douglas, Utah
and
"Bill" O'Connell, Jr., Pres.
W.J.O. Tech. Consultants
San Francisco

Jim S. Peters, Gen. Mgr.
Marin Water Distr.
San Rafael, Calif.
and
Fred S. Porter
Engr. of Water
Long Beach, Calif.

Clyde C. Kennedy
Consulting Engr.
San Francisco
and
Mrs. Kennedy
of Los Gatos, Calif.

Harold W. Yost
Yost & Gardner, Engrs.
Phoenix, Ariz.
and
"Bob" Anderson, V.P.
Worthington-Gamon Mt'rs
Newark, N. J.

V. W. Hannan
Supt. of Water
Anheim, Calif.
and
Harry R. Crane, Pres.
Flexible Rod. Equip. Co.
Los Angeles

These data are transferred to a set of basic design maps which instantly reveal the most significant operating conditions during each calendar year. These are further supplemented by a "Duty Map," which reveals supply demands for various districts, intensity of demand (peaks) and financial data, including collected income from water sales.

As a matter of interest, the Los Angeles Distribution System covers 350 sq. mi., contains 4,275 miles of main. On the entire water supply system there are 50 major reservoirs, 75 minor reservoirs or tanks, 30 odd pumping stations.

"Water Consumption and Unaccounted-for Losses" by H. A. Harris, Jr., Engr. of Design, California Water Service Co., San Jose, Calif.

Mr. Harris' company operates 20 separate water supply systems, serving 30 municipalities with populations from 100,000 down to 1,750. An interesting note was that in the largest community the average consumption had been one-half that of another community with two-thirds the number of customers. Worse yet, the peak use rate had been three times greater than that of the municipality with 45 per cent more customers. The answer is found in the fact that the larger system is about 100 per cent metered, the smaller only 25 per cent metered. Of the 20 communities the average daily demand per service varied from 240 gpd. to 1,150 gpd.; the maximum day's demand per service, 455 to 2,500 gpd. Recording meters are maintained on all sources of supply and storage facilities. A typical graph discloses maximum hour demand at 150 per cent of average and minimum at 50 per cent of average.

In 1943 an experimental educational campaign in the proper use of water for sprinkling and irrigation netted a reduction of only 10 per cent from the 150 per cent peak during hours 5 to 9 p. m. However, for the entire community this reduction represented a 2,000 gpm. lower pumping rate from 5 to 9 p. m., demonstrating that the educational campaign was worthwhile.

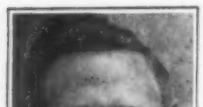
In discussing unaccounted-for water, Mr. Harris was of the opinion that 10 per cent was a reasonable figure and advocated the financial soundness of providing all needed equipment for maintaining continuous records which are essential in the discovery of water waste.

Post-War Project Planning

"Post-War Planning for Water Utilities" was discussed and analyzed by Chester A. Smith, Consulting Engr., Burns & McDonnell, Engrs., Kansas City, Mo.

Mr. Smith stated that Americans who amount to anything are not desirous of having another period of W. P. A. for public works construction. To avoid another Federal Aid program, water supply authorities are being urged to do their share in providing work for the expected period of slack following cessation of fighting and war contracts. He asked water works managers if they would be actually ready and equipped to proceed promptly with economically sound betterments, over-due replacements and repairs, and needed extensions. In considering what water works managers might find worthy of planning toward, in addition to the more evident needs, Mr. Smith listed a few questions taken from "A Checklist for the Water Works Executive," which was published in the AWWA Journal for May, 1944. He urged its examination by all who had a true desire to improve their water supply systems at a time when the most benefit to all concerned would be realized.

Concerning improvements designed to reduce plant operating costs, Mr. Smith asked some questions of his own, such as (1) "Are you confident that your pumps are producing modern efficiency?" (2) "Is your friction loss too high, due to mains of too small original diameter or tuberculated?" (3) "Do you lack elevated storage facilities of adequate capacity at proper locations to effect pumping economies and more adequate service pressures?" (4) "What would a careful analysis of your system by application of the Hardy Cross method disclose as hidden weaknesses?" (5) "What might be the financial savings from planning improvements based on such a scientific but practical analysis of the system?" Mr. Smith then went on to cite examples of what the Hardy Cross analysis had accomplished for the smaller systems as well as the more involved larger systems, such, for instance, as pumping pressures reduced from 114 psi. to 61 psi., and 85 psi. to 35 psi. in another case. Then there was water quality to be considered, and the possibilities of instituting treatment to better the quality in this more enlightened age in which water is no longer acceptable just because it is wet and safe to drink. It was somewhat surprising to learn that in the entire state of California, with 400 odd public water supplies, there existed but 69 treatment plants for producing a water of improved physical and/or chemical quality. Mr. Smith ended with a plea to water works executives that they do not become too satisfied with their present systems, but look for a better system and one that can improve service and/or be operated more economically, even though the betterment may entail scrapping of still useful equipment for reasons of obsolescence due to low efficiencies rather than physical



Purification Officers

Oscar Blumberg
Advisor
State Dept. Health
San Jose, Calif.
(Retiring Chm'n)

H. C. Medberry
Chief Purif. Engr.
Water Dept.
San Francisco
(Secy.-Treas.)

(With apologies to the incoming chairman—Harry Hayes of Los Angeles—whose picture we flopped on.—Ed.)

depreciation. In Mr. Smith's talk there was ample food for thought and we can heartily endorse his advocacy of the AWWA Checklist and the question and answer route for making more evident those things which should prove worthy in a post-war improvement program.

Major G. E. Arnold, WPB Area Engineer, added the thought that water works operators and managers were thinking too much in the past and not looking ahead to new water uses or the new water quality standards. Pointing out that the local water utility had been long "kicked around," whereas a little attention to dressing up the offices and production properties might well raise public estimation of the communities' most important utility.

"Liability for Water-Borne Disease," by James H. Howard, General Counsel, Metropolitan Water District of Southern California, Los Angeles.

Mr. Howard stated that wherever liability is involved in a damage claim against a water utility, courts are of a mind that publicly and privately owned utilities should be held equally liable and in both instances the rule of negligence controls in most cases. In other words, before damages can be awarded, negligence must be proven by the plaintiff. This, of course, is not easily done. Mere knowledge on the part of the water utility of a hazardous condition is in itself not proof of actual negligence; however, in cases where chlorination has been permitted to lapse, negligence has been held to exist by courts and damages to disease victims awarded. In another case where bypassing of check valves was permitted to exist, gross negligence was held to exist.

In other instances where warranty was claimed to exist in the matter of water service, fire protection or water quality, courts have held that although water supply is a proprietary endeavor, still no warranty in fact existed.

Answering the question, "Will giving public notice of polluted water in the mains be sufficient to avoid responsibility should disease result?" Mr. Howard replied, "No, not as a rule."

Water Purification Sessions

(Reported by K. W. Brown,* Chemical Engr., San Francisco, and J. R. Rossum,* San. Engr., Calif. Water Service Co., San Jose, Calif.)

Speaking on the **"Application of Ion Exchangers,"** Paul F. Bovard, Manager, California Filter Co., San Francisco, traced the history of these materials and outlined some of their fundamental characteristics.

Development of base exchange zeolites to maximum efficiency was followed by the introduction about five years ago of carbonaceous zeolites which can be utilized for the removal of sodium and potassium as well as calcium and magnesium. Exchange values for all cations vary from about 9,000 to 12,000 grains per cu. ft. and regeneration is effected by sulphuric or hydrochloric acid,

Programmers

C. G. Gillespie
Chief Engr.
State Dept. Health
Berkeley, Calif.

Adm. J. K. Hoskins
Asst. Surgeon Genl.
U.S.P.H.S.
Washington, D. C.

with typical acid requirements as follows:

Cation Removal	H_2SO_4-66° Be.	HCl-30%
10,000 gr. per cu. ft.	3.9	9.36
12,000 gr. per cu. ft.	5.28	12.52
15,000 gr. per cu. ft.	9.90	23.4

Synthetic resins exhibiting both anion and cation exchange properties were first brought to light in 1935, but commercial use is a comparatively recent development. These materials make it possible to remove

Notables

W. W. ("Bill") Hurlbut
Asst. to the Chief
Dept. of Water and
Power, Los Angeles

Geo. W. Pracy
Supt. of Distrib.
Water Dept.
San Francisco

(Past Presidents of A.W.W.A. both)

all dissolved solids and to produce water comparable to distilled water in quality. The top limit for economical operation appears to be in the neighborhood of 1,500 ppm. total solids, or about 90 grains per gallon, as $CaCO_3$.

Mr. Bovard presented average cost data for softening a ten grain water, as shown in the following table:

Cycle	Regeneration Material	Cost of Regeneration Material per lb.	Cost per 1000 gal.
Sodium	Salt	1 cent	$0.025
Hydrogen	66° Baume H_2SO_4	1½ cents	0.05
Anion	Soda Ash		0.075
Complete Removal of Cation and Anion			0.09-0.10
Ditto for 5 grain water			0.05
Ditto for 20 grain water			approx. 0.12

Problems involved in the **"Disposal of Softening Plant Wastes"** were discussed by James M. Montgomery, Cons. Engr. of Los Angeles. Outlining four different methods of water softening and reviewing ways and means of disposing of the waste product associated with each process, Mr. Montgomery said that sludge from lime-soda or lime-zeolite plants may be impounded and settled in open basins or discharged into flowing streams. Other possibilities are selling or giving away the sludge for agricultural purposes, and reburning it for re-use in the softening plant.

Waste brine from zeolite softening plants may be disposed of by discharging into streams, lakes, or tidewater. In semi-arid western areas, however, disposal is a relatively difficult problem. For the lime-zeolite plant of the Metropolitan Water Dist. of So. Cal., spent brine must be disposed of through a pipe line approximately 20 miles long, the cost of which was about one-fourth the cost of the entire softening plant.

Proper disposal of softening plant wastes is a problem which must be satisfactorily solved for each installation. Other things being equal,

*The first four papers being reported by Mr. Brown and the last four by Mr. Rossum.

it is often found that the choice between plant sites will be determined by the means available for handling the waste product.

"Operating Experiences at the Laverne Softening Plant" were discussed by Mr. Lee Streicher, Chief Chemist, Metropolitan Water Dist. of So. Cal.

When the lime-zeolite softened water of low alkalinity first entered the distribution lines of member cities, long established equilibria were upset, causing sloughing of accumulated growths and deposits. This condition was corrected simply by reducing the lime dose and maintaining a finished water alkalinity comparable to that of the water previously supplied. Lime treatment was subsequently discontinued until August, 1944.

Three years' use has reduced the capacity of the zeolite units to some extent. One difficult problem of operation developed because of an increase in the insoluble content in the salt used for regeneration. Correction of the difficulty was afforded by adding a third salt storage basin.

Chloramine residuals have been difficult to regulate because of long retention periods in transmission lines and varying distances of member cities from the softening plant. This condition has been corrected to some extent by supplemental chlorination at three points out on the system.

Experimental work is now in progress on zeolite regeneration characteristics, on corrosion inhibitors, and on electrolytic treatment of water. Mr. Streicher stated that passage of a direct current through water in an especially designed unit results in a reduction in anion concentration as well as in hardness constituents and total solids. Further investigation is necessary on the practicability and costs of the process.

Drawing on thirty years of experience with the trial and error method, F. T. Willis, Supervising Foreman, Chanslor-Canfield Midway Oil Co., McKittrick, Cal., presented a paper entitled **"Softening Water for Oil Field Use,"** in which he described a lime and soda softening plant of his company.

Trouble with carbonate precipitation in 7½ miles of transmission line has been corrected by applying Calgon ahead of the filters at a rate of 1.5 ppm. Pump runners now remain perfectly clean, filter sand stays in good condition, and repeated cleaning of the transmission line is no longer necessary.

Round Table Leader
Walter O. Weight
Distr. Manager
Hersey Meter Co.
Los Angeles

"Operation and Maintenance of Water Treatment Plant Appurtenances" was dealt with by Carl M. Hoskinson, Ch. Engr. and Acting Supt., Div. of Water and Sewers, Sacramento.

Deterioration of equipment is caused by friction, corrosion, electrolytic action, and by a breakdown in dielectric strength. Concerning lubrication and lubricants, the number and variety of lubricants should be held to a practicable minimum, making certain that the quality is the best available for the intended use.

Protection against corrosion is an economic problem involving due consideration of useful life, the benefits accruing from scraping and painting, and the cost of replacement. For applied coatings, Mr. Hoskinson prefers a high grade coal tar enamel applied approximately 3/32-in. thick over a thoroughly cleaned surface which has been coated with a coal tar cold priming solution. Thereafter it is best practice to examine the finished surface for pin-holes and flaws by means of a high tension spark test.

Electrolytic action, usually brought about by contact of dissimilar metals in the presence of a weak electrolyte such as water, is a common cause of metallic deterioration (e.g., the use of cast iron fittings on black iron pipe, which results in failure of the threaded joints). Such troubles may be minimized by providing a perfect electrical bond between the dissimilar metals and by excluding contact with the surrounding electrolyte or earth.

Failure in dielectric strength of any piece of electrical equipment may be detected by means of a portable instrument known as a "megger." Systematic and understanding use of this instrument, supplemented by appropriate corrective measures. Such use at Sacramento has obviated the need for carrying insurance on electrical equipment to cover internal failures. In the maintenance of electrical equipment in general it is well to follow the detailed instructions furnished by the manufacturer.

"Bacteriology of Water Pipes: An Introductory Note" was the title of the paper presented by Carl Wilson, Consultant, Los Angeles. Discussing the growth of non-pathogenic bacteria in water mains, Mr. Wilson pointed out that the usual techniques for determining total count were misnamed. Actually, total count reveals only the number of bacteria which will grow under the conditions of the test and is not a measure of the total number of bacteria actually in the water. This point was illustrated by showing that crenothrix, which grows luxuriantly under the proper conditions in water mains, will not grow on either agar or gelatin.

Unusual though it may seem, crenothrix is able to grow in one portion of a water main but unable

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San Bernardino

Frank S. Currie
Cons. Engr.
Currie Engrs.
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Engineer
The Dorr Co.
Los Angeles

Richard Bennett
City Engr. &
Supt. of W. & S.
Phoenix, Ariz.

to grow in another portion of the main carrying the same water. In one instance, the growth occurred in a large pipeline where the water entering the line contained essentially no manganese or iron, but dissolved small quantities of iron and manganese from the pipeline itself, thereby creating a desirable environment for crenothrix to flourish some distance downstream.

In another instance, carbon dioxide had been reduced to a minimum by treatment with soda ash, thus forcing the bacteria to obtain carbon dioxide from the bicarbonate dissolved in the water. The resulting precipitation of calcium carbonate encrusted the crenothrix in oôliths which then prevented further growth. As these oôliths were scoured from the walls of the pipelines and collected in low spots, other bacteria, in their life processes, produced carbon dioxide which dissolved the calcium carbonate and permitted further growth of crenothrix.

Another point of interest was the concept of bacterial microspheres. This concept is based on the fact that bacteria frequently secrete gelatin in which they imbed themselves. Inside of this mass of gelatin, conditions for growth may be entirely different from the environment outside the gelatin microspheres.

There is need for further study of slime growths in water pipes because very little is known about the symbiotic relations for communities of organisms and even less of antagonistic or antibiotic relations.

"Trends in Water Laboratory Practice" was the title of a paper presented by E. W. Graham, Ch. Chem., Dept. of Water and Power, Los Angeles.

Mr. Graham gave the results of a survey of 41 laboratories to determine the equipment and the techniques used. These laboratories were distributed throughout the United States, giving a representative viewpoint for the nation as a whole.

Mr. Graham pointed out the need for revision of several of the techniques in "Standard Methods." The number of laboratories deviating from the standard technique correlated well with instances wherein improved techniques have been developed.

In a progress report on **"Simplification of Soap Method for Determining Calcium, Magnesium, and Total Hardness in Water,"** J. J. Connors, Chem. and Bact., East Bay Utility Distr., Oakland, Cal., presented information to show that calcium and magnesium do not require equivalent amounts of soap and stated that no satisfactory explanation of this phenomenon had been found.

Using a special soap solution, borate buffer, and standard shaking, the calcium end point is taken when a formation of minute bubbles occurs around the periphery of the standard 4 oz. oil bottle. This is found to require a deduction for lather factor of only 0.1 ml. The calcium end point is satisfactory providing the ratio of magnesium to calcium does not exceed two to one.

"Value of the Water Works Chemical Laboratory," by E. I. Lynde and Frank E. Marks, was presented by Ted V. Ackerman, Asst. Engineer, Pasadena Water Dept.

In this paper the authors cited a number of instances where the water department laboratory was able to solve various problems.

In one instance a basement had become flooded; the owner of the building complained that the flooding was due to a leaking water main. Physical examination of the property failed to reveal the source of the water. A chemical analysis, however, was able to demonstrate that the source of the water was rain water.

The authors suggested that in post-war planning consideration be given to extending and improving laboratory facilities at water and sewage plants.

"Water Treatment at Eureka, Calif.," was to have been described by Roy Coupal, City Bacteriologist of Eureka, but when the chairman called for Mr. Coupal's paper, nobody could report *"eureka!"* P. S.—The author was out searching for lantern slides and when he returned the session had been adjourned unfortunately. (For further comments see "Doc" Symons' column, "Here and There."—Ed.)

Current Problems Round Table

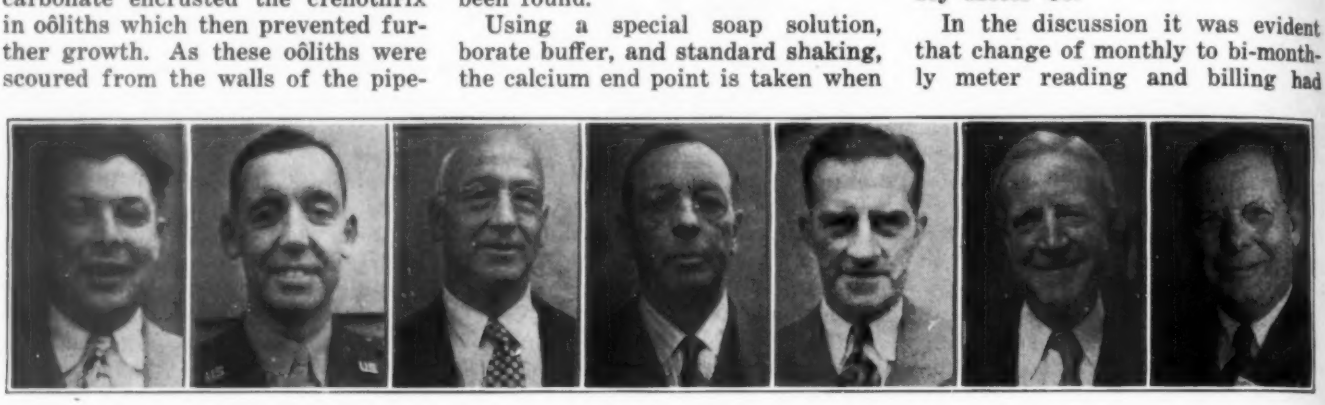
(Leader, Walter O. Weight)

The Conference closed with a Round Table Discussion of Current Problems conducted by Walter O. Weight, Los Angeles Manager, Hersey Meter Co.

In the discussion it was evident that change of monthly to bi-monthly meter reading and billing had been eminently satisfactory. Collections had been as good as under monthly billing and many managers never expect to return to monthly billing. A considerable financial, as well as work saving, had been noted.

In main sterilization there was in general a dissatisfaction with results. In California it seems to be the rule that Fire Departments assume the care and maintenance of fire hydrants, and the Water Department or Water Company does nothing to hydrants beyond keeping them painted unless requested by the Fire Department to make repairs. In California there is no frost problem, of course.

An interesting case of lead service failure was brought to the attention of the group by Mr. Blackburn, Asst. Supt., Pasadena Water Dept. Exhibits disclosed what appeared to be internal corrosion which thinned the pipe walls to the point of pressure blowout. A similar observation in San Francisco was reported by Supt. Geo. Pracy, who said that no satisfactory explanation had ever been found. Dr. Carl Wilson, Water Technologist, believed the pitting and corrosion was caused by bacterial attack on the lead.



"Ken" A. Keirn, Div. Mgr., W. & T. Co. San Francisco

Maj. G. E. Arnold, Water Div., W.P.B. San Francisco

Harry Reinhardt, Vice-Pres., Calif. Water Co., San Francisco

Ralph H. Hyde, Manager, Campbell Water Co., Campbell, Calif.

L. J. Alexander, Design Engr., So. Calif. Water Co., Pasadena, Calif.

N. A. Eckhart, Gen'l Mgr., Dep't of Water, San Francisco

Harry R. Crane, President, Flexible Rod Co., Los Angeles

BUFFALO WATER DEPARTMENT HAS POST-WAR PLANS

By

ALAN D. DRAKE
Director of Water

and

NEWELL L. NUSSBAUMER
Commissioner of Public Works

CITY OF BUFFALO, N. Y.

THE Water Department of the City of Buffalo operates a water intake, water treating facilities, pumping plants, distribution system, storage facilities, and an independent and separate fire line connected with high pressure pumps serving the downtown business area. There are also related shops, storehouses, and the main office which takes care of billings and collections.

During the war period, many persons have left the water department employ to seek positions paying more money. For that reason the performance of much needed maintenance was not possible during the last two years. Contemplated improvements likewise have been delayed, and it has been necessary to set ahead the general future planning by the corresponding number of war years during which work could not be done.

Looking Forward

Looking forward to the post-war period, it seems probable that the needed maintenance work can be done, needed improvements will be secured, and improvements in the water department organization effected. During normal times, such as preceded the war, the latter might not have been possible. The deferring of needed maintenance in the case of Buffalo was not only a matter delayed on account of the war, but in preceding years was delayed on account of inadequate budget allowances.

The water department is looking into the post-war period as a time when the department, together with its operating facilities, can be put in first-class condition, provided the plans for these various improvements are available at the proper time, and such substantiating data is produceable, to indicate the necessity for the work in competition with other projects and work which other city departments and agencies in the City of Buffalo may desire.

In the first case, the Mayor's Post-War Planning Committee, which has been studying various projects for post-war construction in the City, has laid out a policy for projects

The Authors

which might be termed "self-liquidating," and which would add no operating expense to the city budget. These will be preferred, as charter limitations prohibit the expansion of funds for operating purposes.

Specific Plans and Projects

With this thought in mind, the water department has reviewed its needs and has selected the following items, for which they will prepare as much data as possible to assure the completion of the proposed work in the post-war period, and to assemble the data in such shape that it will have sufficient sales appeal to merit consideration above other competing local projects.

1. Install rotary surface wash for the balance of 32 filters, 8 having been equipped previously with Palmer type sweeps. The filters in the Buffalo filter plant are 4 mgd. capacity each.

In 1939 the Palmer surface wash sweeps were installed in eight filters in the Buffalo plant. During these past five years they have demonstrated their worth, so that the outfitting of the balance of the filters is very desirable.

2. Install umbrella type nozzles which were omitted during original construction in the manifold headers of the distribution system in the bottom of the filters. This was probably an oversight. Their installation will increase the capacity of the filter by a substantial amount. At the same time these two improvements are made, it is proposed to remove, wash, grade and reinstall the sand and gravel in all the filters, placing a 10-in. anthrafilt cap on each filter.

These two projects, we believe, can be set up to liquidate the construction cost in a comparatively short length of time.

3. Electrify the Massachusetts Ave. Pumping Station, which is the original water pumping station in the City of Buffalo, and has a capacity of 120 mil. gal. per day in four units of the triple expansion type pumps. The equipment is about thirty years old. (See Fig. 1.) The boilers have reached the point where they need extensive repairs. A modern electrified station, if built, could be operated with considerable economy, and the pumping synchronized better with the present units in the Ward Pumping Station.

Over a period of years it is felt that the economies would offset the amount of money required for the project. In addition there is some prospect of securing assistance from outside sources for this particular project, as the pumping station is in the line of a proposed new waterfront highway. The new station could be located alongside the highway without interfering with the proposed improvement.

4. There are in the City of Buffalo about 9,000 hydrants. These hydrants have received little attention in the past three years. Many have not been painted in over five years. We would propose to paint all the hydrants. At the same time a complete check of the operating features of the hydrants would be made.

5. Perform needed maintenance and repairs to various water treating structures. These structures include the water filtration plant, the main Ward Pumping Station, the Massachusetts Pumping Station if not rebuilt, the Grover Cleveland and Kensington water towers, which are tanks enclosed in masonry structures, also maintenance shops and garage. The work includes painting, pointing of exterior and interior brick work, repairing gutters, and repairing tile roofs.

6. Paint three elevated storage tanks. (One shown in Fig. 2.) The tanks hold 2 mil. gal. each, average about 100 feet in height to the bottom of the tank, were erected in

1935, and have not been painted since. During the present year a small budget allowance was used to spot paint the legs with red lead and oil where serious corrosion has started. The last three projects, items No. 4, 5 and 6, are strictly deferred maintenance. The work will have to be done at some time in the near future in any case, whether there is a post-war program or not.

7. A pitometer survey of the general distribution system in the City of Buffalo is proposed to determine what points of re-enforcement to the distribution mains are required. The re-enforcements might be in the nature of parallel construction, the cleaning of existing mains which have low friction coefficients or the lining of certain mains with cement or other material to obtain better friction coefficients and thereby secure additional capacity.

It is proposed to engage consulting engineering services to direct the work, but a large part of the field measurements and general survey work will be performed by the city pitometer department. After the conclusions are drawn as to what work is to be done, then detailed plans and specifications of the required work will be made by the engineering department in the division of water.

The actual construction work will provide a good deal of employment for common labor and semi-skilled mechanics. It is the type of project that can be started quickly, and run for whatever length of time might be desirable due to unemployment conditions. When employment improves, the project could be stopped and again started whenever employment conditions might require. The program could be laid out in a most flexible manner. The amount of money required for certain parts of this work for material expense would be small in relation to the amount spent for labor.

8. Make a valuation of the various properties under the jurisdiction of the department of water. Such a valuation has never been made.

There have been several efforts in the last few years to increase the water rates to meet wartime conditions, and additional operating expenses encountered in the production of water. The basis upon which any revision of rates would be made would be a valuation of the system. Until this is available, any revision in the water rate structure is rather vulnerable.

Immediate Post-War Needs

The Mayor's Post-War Planning Committee has recentlly pointed out that the post-war period may immediately require a number of projects for construction, small in scope, which can be quickly put in operation, and will employ a fairly large number of men to assist in reducing unemployment during a transition period when manufacturing plants are tooling up for domestic production. The large scale projects may be delayed until it is seen whether or not industry can actually employ the various persons released from wartime industries and the armed services. Under the circumstances it behooves the water department to have both classes of projects available and ready for construction.

In addition, it is probable in any period of unemployment that there will be engineers unemployed as well as others. Therefore, a project such as the valuation of the water works properties will supply employment for technical personnel with practically no material expense. It is probable that some consulting engineering advice might be required to direct the work.

Metering the System

There are two other projects, which might be termed desirable but not essential at the present time. The first is the installation of meters on house services. At the present time the City of Buffalo has approximately 90,000 unmetered services, charges being made on a flat rate basis.

The cost of purchasing these meters would probably approximate $1,000,000, without the necessary installation costs which would be borne by the householder. This large cost has been the principal reason why these meters have not been installed in the past. The City of Buffalo has had water producing facilities ample in size at all times in the past. The time may come in the future, due to industrial expansion and population increases, when some increase in these facilities might be required. At that time it might be less expensive to install meters, with the resulting saving in pumpage at the treating plant, than to make large scale additions to the water plant. The average per capita water consumption in the City of Buffalo is now 240 gallons per capita. While this figure seems high, it has run as high as 400 gallons per capita in the past, and has never been below 190 gallons at any time. The rate per capita has increased during the past few years because of the high rate of water consumption by industrial consumers.

The second project is additional coagulation basin capacity, or better facilities for this function. Studies are now being made as to whether additional tank capacity is desirable, or whether the installation of flocculators in the present tanks would provide better service. In accordance with the conclusions, improvements will be made.

Sources of Financing

Two of the above listed projects

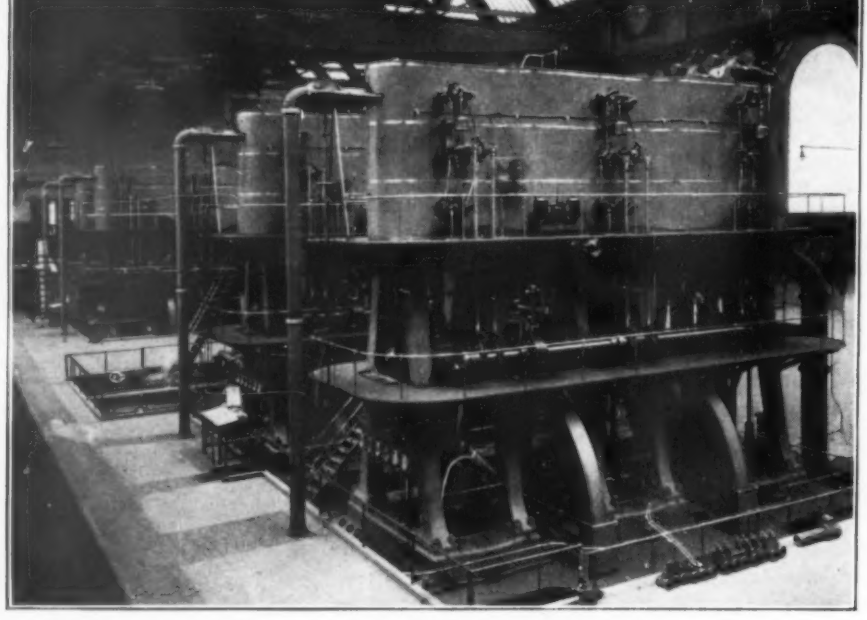


Fig. 1.—Four Steam Operated Pumping Units in Massachusetts Ave. Pumping Station.
(Electrification would pay for itself.)

the department is not able to completely plan with its own limited engineering department. Therefore, applications have been made for State Post-War Planning Commission funds for assistance in preparing the plans for the electrification of the Massachusetts Pump Station and the pitometer survey of the general distribution system.

The water department in the City of Buffalo is not able to accumulate a surplus, as any funds above out-of-pocket budget expenses each year are turned into the general city surplus. Consequently the financing of the construction of any of these projects must be arranged either with budget funds in any particular year, or by general bond issue. As the bonding limit in Buffalo permits relatively small additional financing, any grants from outside sources would be very welcome.

Organization and Salary Adjustments

The department is also arranging for a revision of its organization chart, general lines of authority, and duties assigned to various positions in order to increase the efficiency of operation of the department.

A part of this study relates to salary and wage increases, as the salary survey made in the City of Buffalo which controls wages at the present time was made in 1938 and is based on far lower rates than those prevailing at the present time. Unless some adjustments are made, it is thought that it will be impossible to obtain competent men in key positions at the rates specified.

The department feels very strongly that any post-war program should be flexible to meet the needs of unemployment as they may occur. The schedule of various types of projects which we have here indicated would permit cooperation on almost any scale of activity.

Fig. 2.—Two Mil. Gal. Rees St. Water Storage Tank.
(Erected in 1935-36 by Chicago Bridge & Iron Co.—Tank not painted since erection.)

Sludge Gas Worth $64,359.90 to Gary

Some Highlights from the Annual Report on Sewage Treatment at Gary, Ind.

Within the last few months the superintendent's report on the 1943 operation of the Gary, Ind., sewage plant by W. W. Mathews appeared in our mail. The summary of operating results indicates that Gary had a wet year, particularly in the early part. The result was an increase in flow of approximately 5 per cent and a decrease in gas production of approximately 10 per cent, although the suspended solids increased by more than 35 per cent.

Reduction in suspended solids (96.58 per cent) and B.O.D. (92.82 per cent) remained about normal, as did the cost of operation—$8.70 per mil. gal. or $0.6827 per capita. Aeration requirements have been lower than at similar plants, the air consumption for the last three years being 0.52, 0.46, and 0.41 cu. ft. per gal. With a high rate of gas production and low air requirement, power costs have been low. The value of the sludge gas used (based on a contract for gas with the Northern Ind. Public Serv. Co.) has been $64,359.90 during these three years. Dried sludge was available at no cost to persons wishing it as a fertilizer. The number of persons taking sludge decreased because of gasoline rationing, but to date 7,447 persons have signed the sludge book as takers.

DETERMINATION OF SUSPENDED SOLIDS IN AERATION TANK LIQUOR

By A. A. HIRSCH
SECTIONAL SCHOOL ON WATER SUPPLY AND SEWERAGE*
BATON ROUGE, LA.

DETERMINATION of the suspended solids in mixed liquor is an important control test in the operation of an activated sludge plant, as this quantity enables an operator to manage properly the wastage of return sludge. Since this determination is frequently the only truly operational test, as distinguished from performance tests, that requires use of an analytical balance it is desirable that the method selected be a rapid one and entail only the minimum of incidental pencil work records.

In the technique outlined below a simplifying feature is introduced which consists in writing all weights directly on the back of the filter paper used, thereby preventing confusion when more than one tank is sampled and obviating the usual intermediate work sheet ruled for source, initial weight, final weight and resulting suspended solids. Filtration through paper has been found preferable over other suggested methods due to its convenience, rapidity of filtration and speed in drying, as contrasted with use of Gooch crucibles or drying directly in a centrifuge tube.

Procedure

Steps in the determination of suspended solids in mixed liquor by means of this method are as follows:

1. Dry a 7 cm. diameter filter paper (Whatman No. 2 or equivalent) in an oven at 103° C. for 15 to 30 minutes. Qualitative grade paper may be used if the operator is satisfied with a filtrate that is not altogether clear.
2. Cool for 5 minutes in a desiccator and weigh to the closest milligram. A counterpoise weighing about the same as an average filter paper conserves time in balancing.
3. Write the tare weight directly on the paper about half an inch from its edge. When about to place the paper in the funnel, also mark the tank number of the sample.
4. Meanwhile have 100 ml. of sample of mixed liquor setting in a graduate for about 5 minutes, in order to settle the sludge partially and facilitate filtration.
5. Place the filter paper in a Buechner funnel. Prevent the sludge from spreading beyond the outer edge of the filter paper by pouring the liquor into a hollow cylinder which is placed in the funnel so as to allow 1 cm. clearance. Press the cylinder snugly on the paper. This cylinder can be padded by inserting it into a bicycle tire inner tube and folding over the end to form a gasket. Pour on a few milliliters of supernatant from the graduate, apply suction and filter the sample. Then remove the paper carefully with a knife so as to retain all sludge deposited.
6. Dry the paper and residue for 15 to 30 minutes at 103°C.
7. Fold the paper in half with sludge side in; cool for about 5 minutes in a desiccator, then weigh. Folding retards gain in weight by absorption of moisture from the air in the balance case and in the desiccator when the drying agent is spent.
8. Mark the final weight on the paper directly above the initial weight. Perform the subtraction on the paper; ten times the gain in weight in milligrams gives the suspended solids in parts per million. This result is recorded in the plant record book and the incidental weights are discarded with the used filter paper.

A typical sheet of filter paper used in the above manner at the Springhill, La., activated sludge plant is shown in the illustration.

This method can readily be made to mesh in with the other analytical duties in the plant laboratory. If adopted as routine, a week's supply of filter papers may be preweighted at one time, thereby permitting direct use without individual preparation each day. The above procedure is applicable to the determination of solids in any plant liquor in which the solids content is flocculated and relatively high; it is not recommended for the average influent or the effluent.

Filter Paper with Weights and Tank Number Written on Under Side

*Louisiana State Dept. of Education.

Omission Noted

On page 380 of the November 1944 issue appeared a strip of pictures of exhibits at the 16th Annual Meeting of the Federation of Sewage Works Assns. Beneath that strip of pictures labeled "Exhibits" were the names of four manufacturers' booths. The strip was divided into four parts, but there were actually seven booths appearing. Obviously, the names of three manufacturers were not included. Reason—we didn't have the names in the notebook, and we couldn't make out from the print just what the other three were.

It was not intended that the names of the manufacturers were to be applied to the individual pictures. And especially it was not intended to omit the names of any. Thanks to our friend H. W. Gillard of Infilco, we learned that one of the booths (that with the large Army-Navy "E" banner) was Infilco's. We still don't know whose booths the other two were. Meanwhile, may we be forgiven for a sin of omission—not commission.

LICKING A SUPERNATANT HEADACHE

An Experience With Operating Digesters at Higher Temperature and Sludge Input and Withdrawal Schedules Which Precludes Supernatant Production

By VAN K. THARP
Sanitary Engineer
SCOTT FIELD, ILL.

SO YOU'RE having digester troubles, especially with return supernatant liquor. Well, don't let it get you down, because you're not the only one with that kind of troubles.

"Speed" had 'em, too. But he thinks that he has the whole thing licked now.

And maybe his plant could have been built from the same plans and "specs" as your plant. Anyway, just so you can see for yourself, I'm giving you a sketch of his sludge and digester systems.

In short, here's the way the plant works: Raw sewage flows by gravity through a pair of comminutors to the wet well, from which it is pumped up to the primary tanks and then flows by gravity through the trickling filters and final tanks. Nothing flexible about this plant.

Primary sludge is pumped to the digester by a constant speed, fixed capacity pump. There is nothing flexible about the digester system, either. Just two digesters of the same capacity, one with fixed and the other with a floating cover, and so piped that they must be used in series—so-called two-stage digestion.

Who Ever Invented Supernatant Return?

The supernatant liquor has just one place to go—back to the raw sewage wet well.

This has been the cause of Speed's greatest troubles. The plant was operating at top capacity. He was pumping raw sludge (5 per cent solids) to No. 1 Digester and getting back from No. 2 Digester a supernatant liquor of 3 to 4 per cent solids for return to the raw sewage.

Some fun on that kind of a merry-go-round, huh?

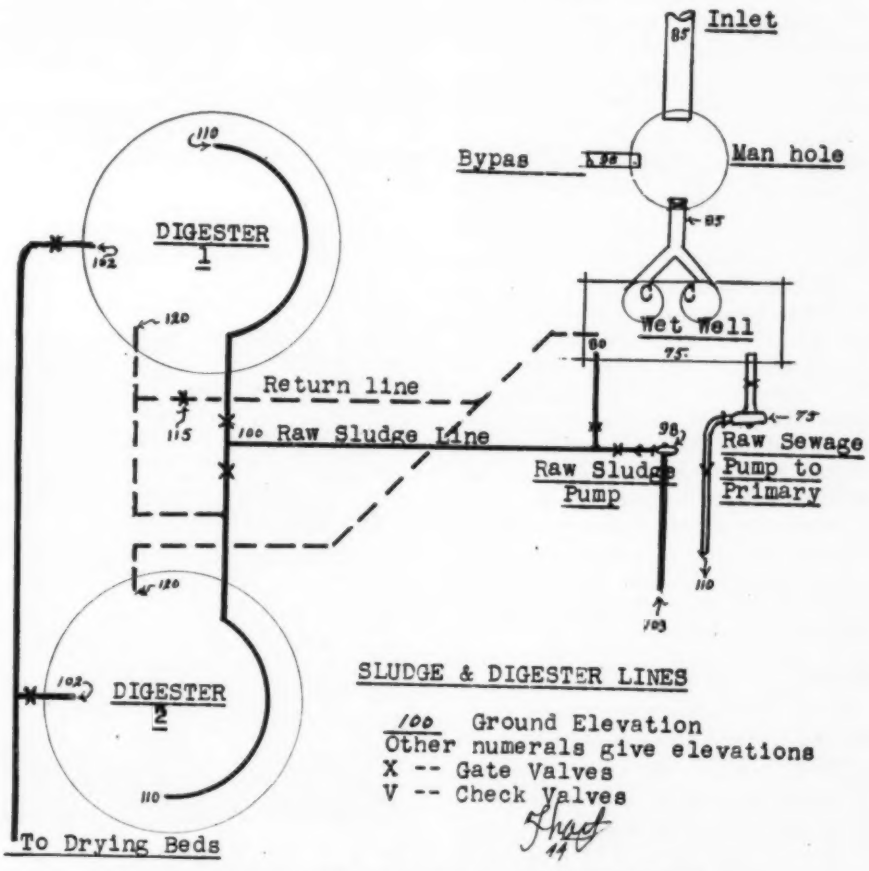
Of course, "Speed" got a lot of suggestions from all sides, but none of them seemed to work.

So "Speed" did a little thinking—and figuring. He put down all the data he could think of pertaining to the plant and its operation and conditions. They stacked up just about average:

1. Daily flow to plant—1.5 M.G.D.
2. Suspended solids (raw)—290 ppm.
3. Suspended solids, mixed with digester return and final tank sludge—340 ppm.
4. Suspended solids, final effluent—25 ppm.
5. Volatile matter (raw)—75 per cent.
6. Volatile matter, mixed with digester return and final tank sludge, 60 per cent.
7. B.O.D. raw, 275 ppm.; mixed, 320 ppm.; final, 20 ppm.
8. Primary tanks were getting darned dirty!
9. Combined digester capacity—400,000 gallons.
10. Raw sludge solids (as pumped)—5 per cent.
11. Digester return liquor solids—3 to 4 per cent.
12. No. 1 (fixed cover) Digester, solids—4 per cent, top to bottom.
13. No. 2 (floating cover) Digester—range from 3 per cent solids at top to 7 per cent at bottom.
14. Volatile matter in No. 1 Digester—50 to 60 per cent.
15. Volatile matter in No. 2 Digester—49 to 58 per cent.
16. Temperature No. 1 Digester—96 to 99 F.
17. Temperature No. 2 Digester—88 to 96 F.
18. Gas Production—20,000 cubic feet per day.
19. Raw sludge pumped—16,000 gallons per day.
    (According to figures on suspended solids in raw sewage, the total raw sludge pumped should not be more than 10,000 gallons per day, with due allowance for final tank sludge.)
20. pH of digester contents, 7.2 to 7.6; of raw sewage, 7.4; primary effluent, 7.2; filters, 7.6; and final effluent, 7.4.
21. Volatile matter in sludge drawn from digester to beds—52 to 60 per cent volatile. Solids in sludge drawn—6 to 7 per cent.

What "Speed" Did About It

Now "Speed" had tried to follow



Sludge and Digester System of "Speed's" Plant

Here "Speed" Was Following Advice and Drew 150,000 Gallons of Sludge from No. 2 Digester in One Day
(It helped for about ten days)

a lot of suggestions. He cut the digester temperature from 99 down to the low 80's. He gave No. 1 a rest. He drew out all but a seeding from No. 2.

That last idea worked for almost three weeks, then when the digester had been full for about four days only, the return liquor was back at 3 per cent solids.

"Speed" got mad. He said, "To heck with all their ideas!"

He raised the temperature of No. 1 Digester from 90 to 102 F. No. 2 followed suit with a jump to 98. Regardless of flow to the plant. he held the total daily sludge pump to 10,000 gallons.

With a total digester capacity of 400,000 gallons, the 10,000 gallons per day would give a retention time of 40 days. At 102 degrees, 40 days should be ample digestion time.

Next, without regard for condition of the sludge, he took 12,000 gallons per day, six days each week, from No. 2 digester to the drying beds. This gave him 72,000 gallons per week withdrawn against 70,000 gallons added to the digesters. Over a period of two months he missed drawing off sludge just a few times. He kept the level of No. 2 digester just below the supernatant return pipe. In other words, there was no longer any return of supernatant to the incoming sewage.

Results

After three months of such practice here are the results:

1. Raw sewage—B.O.D., 300 ppm.; suspended solids, 295 ppm.
2. Mixed with final sludge, returned to the raw sewage—B.O.D., 305 ppm.; suspended solids, 310 ppm.
3. Final effluent—B.O.D., 18 ppm.; suspended solids, 20 ppm.
4. Raw sludge, 10,000 gallons per day—5 per cent solids, 72 per cent volatile.
5. Digested sludge to beds (average), 9,360 gallons per day—6 per cent solids, 46 per cent volatile.

Sure, "Speed" knows it. Everyone has told him, "You're going to get into trouble with your heating coils operating at that high temperature. They're gonna cake on you. . . ."

But "Speed" just laughs at them. He tried that high temperature for another reason the first year his plant was in operation. It was winter and he needed gas to heat the plant. So for a week he wore his overcoat in the office and shot all the heat the boiler would produce into the digester and raised the digesting sludge temperature to 110 F. He held it that high for over six months. He inspected the coils and nothing had happened.

So "Speed" says he'll take a chance this time, too.

And now he's getting more ideas. He says that he's going to get the final B.O.D. and suspended solids down to a figure of a single digit.

"Speed" Picks Up a Sample of Raw Sewage
(And shows what the well dressed sewage operator is wearing this year)

Ed. Note: Correspondence with contributor Tharp reveals "Speed" to be Clarence Shaulter, Senior Operator of the plant described.

We don't know how "Speed" came by this nickname, but we can see that he does his own thinking, and that's what it takes to make a real plant operator. Thank you, Van Tharp, for telling us "Speed's" story.

Daily Sludge Withdrawal Requires Constant Removal of Dried Sludge from the Beds

PROBLEMS IN HANDLING SEWAGE SLUDGE

CHARLES R. VELZY
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NEW YORK CITY

THE disposal of sludge has always been one of the major problems of sewage treatment. It is not in itself a primary objective of treatment. It adds materially to construction and operating costs, and the preparation of the solids for final disposal is fraught with many difficulties. It has been a necessary evil, rather than an asset.

Sludge handling problems differ according to the type of sludge, and the magnitude of the difficulties varies as widely as the characteristics of the material being handled. Activated sludge is liquid and homogenous, and presents few mechanical or hydraulic problems. Primary sludge, on the other hand, is of lower moisture content, contains solids which are coarser and partly of a fibrous nature, and usually carries grease in an amount to be troublesome. Its characteristics cover a range from a relatively freely flowing heavy liquid to a semi-solid which refuses to move under the action of a positive displacement pump and the coaxing of a skillful operator. A mixture of activated and primary sludge may show characteristics anywhere between these extremes. This discussion relates to the problems encountered in handling sludge having the more stubborn characteristics.

At least two of the "gremlins" plaguing the sludge operator can be identified and are well known. They are the trash or ground screenings which come through the settling tanks, and the grease which is usually handled with the sludge. The troubles caused by these materials have led to the suggestion that they should not be returned to the sludge when once removed from the sewage. It is often found, however, that disposal with the sludge is less troublesome than separate disposal and the problems related to and aggravated by these materials are therefore frequently encountered.

Trouble from screenings may be reduced by attention to a number of details in plant design and operation. Screenings may be designed with relatively close bar spacing (¾ inch or 1 inch), and the grinder may be arranged to discharge the

The Author

ground screenings on the upstream side of the screen. Some of the coarser material passing the grinder is thus caught again and reground. It is obvious that the grinder should be kept in good condition, particularly to minimize the passing of long fibrous material.

In a treatment works where large quantities of leaves and other trash are likely to accompany or follow a storm, it may be advantageous to provide for by-passing the grinder to keep the screenings out of settling tanks at times of heavy load. The elimination of what might constitute a "slug" of clogging material is worth while, and since the screenings at such times are relatively clean, separate disposal is not too difficult.

Grease is difficult to handle wherever it is found. Skimmings from a settling tank require mixing with large quantities of water. The water must be largely separated for economical pumping, but if separation is too complete, the grease "cakes" and cannot be pumped. It tends to congeal in pipe lines, and in a sludge tank it floats and adds to the burden of control of top sludge or scum.

These problems are being minimized at some plants during the war by salvaging the grease. The skimmings from the primary settling tanks are removed and sold. Operators at these plants report appreciable reduction in grease troubles in pipe lines and in quantity of floating material in sludge tanks.

For the sake of discussion, the problems in handling sludge from the time it leaves the settling tanks until it is ready to leave the sludge tanks are classified into four categories, as follows: (1) pumping problems, (2) troubles encountered in pipe lines, (3) metering, and (4) problems in the sludge tanks.

Pumping Problems

Discussion of sludge pumping always leads to consideration of types of sludge pumps. The competition between the displacement pump and the "screw-feed" centrifugal pump will probably continue for some time. In discussing their relative merits, one plant superintendent once said that he thought an operator having both types available would always use the centrifugal so long as it was effective, because it was simple and clean to operate and required a minimum of maintenance. For high suction lift or for discharge pressure above normal, however, the displacement pump is better adapted. In a plant recently built where two sludge pumps were needed, one of each was specified in order to cover a wide range of sludge characteristics and also to obtain the advantages of both types of pump.

It has been stated that a displacement pump operates better with some suction lift than with pressure on the suction side. However, the need for minimum length of pipe and the fewest possible bends in the suction lines often points to placing the pumps below the water level of settling tanks. Some pressure in the line also is an aid in keeping the line clear of gas. The designer must weigh these and other factors in each plant design and adopt a layout best fitting the conditions.

Considerable uncertainty is involved in determining the operating pressure for which sludge pumps should be designed. It is a problem which does not conform to hydraulic formulas, and the answer must, therefore, be derived from experience and judgment. Particularly in larger plants, pressures sometimes build up rapidly or a stoppage results in a sudden increase in pressure. A pump which will withstand and operate under a pressure of 50 pounds per square inch will suffer much less interruption than one designed for only 50 feet of head. At New York City it has been the practice to install in each primary sludge pumping station a high pressure pump for

emergency use, which is capable of operation at 100 pounds per square inch. (See Fig. 1.)

At Buffalo the primary sludge pumps specified and built for a working pressure of 50 feet proved to be too light. Breakage occurred in connecting rods, packing gland bolts and in pump body castings. The pumps have been modified, the alterations including new connecting rods, smaller diameter cylinders and plungers, heavier castings and some other changes. Less interruption to operation has been reported.

The variable pressure, wide range in sludge characteristics, and the general severity of the service have led to more sturdy pump design. An example of later design is the triplex plunger pump with variable speed gear drive. (See Fig. 2.) It has a number of advantages over the duplex plunger pump with variable stroke. Added capacity is obtained without excessive velocity through valves, full stroke at low pumping rates results in less slippage than shortening the stroke, and there is always a more uniform velocity in the discharge pipe.

Fig. 1—High Pressure Sludge Pump for Emergency Use (New York City)

The summation of these factors calls for a pump of more rugged construction, and better and more expensive mechanical parts, than was acceptable some years ago. Manufacturers are meeting this requirement, and designing engineers should adjust specifications as necessary to call for the better type of pump where it is needed.

The maintenance on sludge pumps must be expected to be high. Wear on packing and plungers is rapid, and frequent renewal of packing is necessary. For plunger pumps, most operators experiment with several types of packing until one is found that lasts longer than other types. It is difficult to select any make or style of packing as best for all applications, but it is suggested that resilience and resistance to abrasion are two characteristics to be sought.

Relatively frequent restoration of plunger surface is also required. This can be accomplished by installing new plungers. It may be worth while using a plunger with a thick wall so that refinishing can be done one or more times before discarding the plunger. The added clearance resulting from refinishing can be taken up with thicker packing or a shim in the outside of the packing space.

Every operator is familiar with the problem of maintaining cleanliness in a sludge pumping station, particularly where plunger pumps are used. Leaking packing, drawing of samples and cleaning of valves, all contribute to the difficulty of keeping the station clean. Pump bases are usually provided with a lip or curb and a drain to carry off the leakage from the pump, but with sludge this is not effective. Solids from the sludge tend to accumulate within the curb and to clog the drain. Since cleaning must be a continuous and a routine operation of flushing and wiping, it may be helpful to fill the drainage spaces and channels in the pump base to prevent accumulation of dirt.

At the Joint Meeting Sewage Treatment Plant of Essex and Union Counties, New Jersey, each sludge pump is enclosed within a concrete curb. As explained by E. P. Decher, Acting Chief Engineer, this keeps the spilling of sludge "within bounds" and makes it possible to flush around the pump after cleaning valves and the like, without splashing the rest of the station floor.

In addition to thorough cleaning, Mr. Decher offers the suggestion of burning a small amount of sandal wood to overcome any lurking odors of sludge. A recent visit to the plant demonstrated the effectiveness of this "stunt." It should, of course, be born in mind that the burning of incense is not a substitute for cleanliness; and the immaculate condition of the Joint Meeting plant shown that there is no improper use there. This may be worth remembering as a final touch to the preparations for the visit by the Women's Club or the Mayor and his Committee.

Piping:

There has been some difference of opinion regarding the selection of pipe sizes for sludge. One line of reasoning calls for large sizes and low velocity in order to keep friction losses to a minimum, particularly when the sludge is heavy. The other reasoning calls for relatively small lines and higher velocity in an effort to prevent deposits and the congealing of grease on the walls of the pipe. With the differences in sludge characteristics and other conditions in the various plants, it is difficult to make a definite determination on this point.

In recent years operators have reported a number of cases in which grease has been found to accumulate on the walls of the pipe to greatly increase friction losses, or actually to produce stoppage in the pipe lines. In many of these cases pressures have not been excessive except as the grease has accumulated in thickness sufficient to greatly reduce effective diameter. It therefore appears that a reasonable velocity in the sludge line will not cause excessive pressure, unless the line is partly plugged. When a line is partially plugged it is best that it be cleaned and normal operating conditions thus restored.

A part, if not all, of the trouble of grease accumulation in sludge lines appears to result from the pumping of primary settling tank scum through these lines. In a number of plants an operating rule has been established to the effect that scum should not be pumped alone, but should always be mixed with

sludge, and that any pumping period should be ended with an appreciable time of pumping sludge alone in order that a minimum amount of scum will be left in the line to congeal. This practice has been found to be helpful.

At Buffalo a 10-inch cast iron discharge line for raw primary sludge some 600 ft. long was found to fill with grease in a period of a few months. Cleaning was accomplished with live steam introduced through an injector at the pump end of the line. The injector was made to mix water and steam and produced a flow of hot water through the sludge pipe. The grease accumulation would begin to break away from the walls of the pipe at a temperature of approximately 150 Deg. F., and the pipe was found to be well cleaned at a temperature of approximately 180 Deg. F. Cleaning with steam has become routine, being done approximately every four months.

The procedure is accompanied by some difficulties. In the first application of steam a section of the cast iron pipe was cracked by too rapid rise in temperature. With cast iron pipe it is necessary to both heat and cool the pipe slowly to avoid breakage. Another problem with bell and spigot pipe is the tendency for the joints to open and leak as a result of the contraction and expansion.

At some other plants, grease in sludge lines has been removed by pressure. The use of high pressure pumps at New York City plants has been mentioned. Sometimes water under high pressure has been used. It is reported that in some cases grease and other accumulated solids have been forced out of pipes in long continuous "slugs" by the application of pressure.

While these two methods, and probably others, have been effective in cleaning sludge lines, it is still advisable to make the line accessible. Outside the pump rooms the pipe may well be placed in tunnels. If this is not possible, manholes may be built around the bends, and cleanouts provided at bends and at other points for rodding and other cleaning methods, to be used if necessary.

It is suggested that, in larger sewage treatment works, sludge lines be laid in duplicate and be made of steel. This will permit cleaning the lines of grease accumulations by the application of steam or hot water and, if the duplicate lines are cross connected, this cleaning operation can be done without interrupting sludge pumping.

Metering

The metering of sludge is admittedly difficult. Although far from perfect, the Venturi meter is generally found to be the most satisfactory. Accuracy cannot be expected, and refinements in the meter design therefore are not justified. It has been found that one or two openings directly to the interior of the meter are more satisfactory than a Piezometer ring, as the ring is easily plugged with solids. Special cleaning and flushing devices and connections are also helpful.

Sometimes the use of any kind of meter for sludge is questioned because of the difficulty of obtaining satisfactory operation. It is suggested, however, that a meter is worth while, not only because it gives some measure of the rate and quantity of sludge flow, but also because it can serve as a useful indicator to the pump operator. The flow of sludge through a sludge pump may be stopped at any time through clogging of a line or lodging of some obstacle in a valve, and that this condition may not be observed by the operator without some form of indicator. A sharp drop in rate shown by the meter indicates such an interruption in flow.

Likewise, an operator may start a pump without knowing whether or not the sludge actually starts to flow. A normal indication by the meter when starting a pump is reasonable assurance that sludge is flowing, while failure of the meter to respond calls for investigation of the pump, or motor, or both. It is the writer's experience that a sludge pump operator gets the "feel" of the situation so that he becomes skillful in using the meter as an indicator of pump operation, and may also use the pump to indicate the meter operation. Thus if a meter shows no flow while the pump is running, an operator may clean the valves and otherwise assure himself that sludge will flow when the pump is in operation. If the meter still does not register, it is reasonable for him to conclude that the meter needs attention.

This kind of operation appears to be troublesome and a procedure which needs improvement. There are, however, many troublesome factors in handling sludge and this is just another case in which certain maintenance operations must be accepted as routine. In operating a plunger sludge pump, it is routine to clean valves, and constant attention to a sludge meter is in the same category. Flushing of meter connections may well be done daily or oftener to prevent more serious difficulties, and further cleaning of the meter may be required at frequent intervals. In this connection the flushing system for the meter should be of adequate pressure so that the excessive pressures which sometimes occur in the sludge lines will not overcome the pressure of the flushing system.

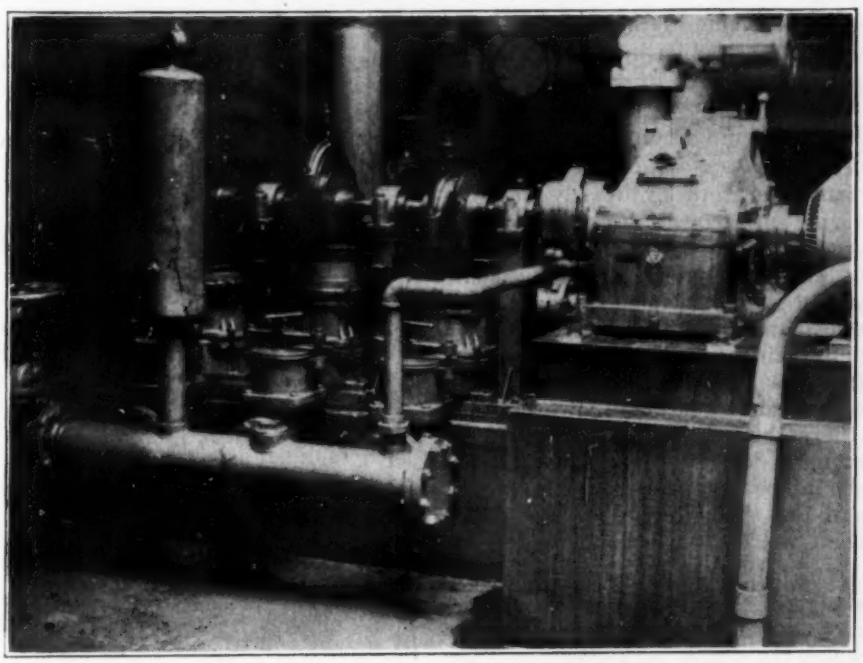


Fig. 2—Triplex Plunger Pump with Variable Speed Gear Drive

Problems in the Sludge Tank

Probably every sludge tank accumulates scum at the top. Some

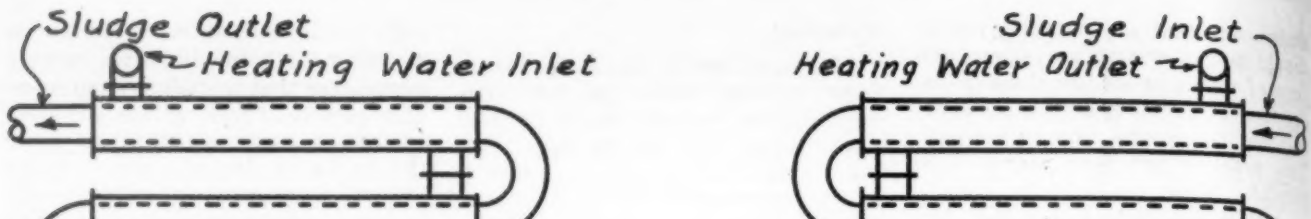


Fig. 3—Heat Exchanger for Sludge

prefer to call it top sludge. Whatever its name, it is obvious that some of the solids introduced into a sludge tank go to the top, while others settle to the bottom. Evidence of scum accumulation is found in the answers to inquiries sent to plant operators by Wisely and reported in *Sewage Works Journal*.[1] Considerable progress has been made in designing tanks and equipment and in providing means for reducing the quantity of top sludge and for minimizing the difficulties resulting from its accumulation. It appears reasonable to assume, however, that where there is sludge there will be scum or floating solids, and that this should be recognized in the design and the operation of sewage treatment works.

The characteristics of the top sludge vary with the nature of the raw sludge and the conditions under which the sludge tank operates. They have a marked bearing on what can be done and what should be done to control or reduce the quantity. In sludge tanks of large capacity the digestion of the top sludge may keep pace with its accumulation and no problems occur, while with tanks of more limited capacity the floating material sometimes builds up to a thickness of several feet. If the solids content increases to above 20 per cent, the material will not flow in a pipe and is therefore difficult to move. It tends to become inactive and may seriously encroach on the digestion capacity of the sludge tank.

In the design of sludge tanks it appears wise to consider the possibility of top sludge accumulating to an extent which may cause trouble. Structures and equipment which keep the sludge moist have merit, and circulation is helpful. Some means for increasing moisture content and withdrawing the material may be appreciated by an operator who finds his sludge tanks handicapped with a thick layer of dense top sludge.

One arrangement for withdrawing this material, which has been found effective, is a pipe line carried to a point near the top and center of the tank, and connected to the suction of plunger pumps. A vertical drop of some 20 feet in this pipe from the inlet point near the top of the tank to the level of the pump provides a "reservoir" into which the scum can flow as it is softened and from which the pump can draw the material. A spray in the gas dome and over the open end of this vertical pipe softens the scum until it will flow. It has been found that scum as high as 40 per cent solids can be moved with this arrangement, and that even the densest scum will gradually flow to the center of the top of the tank as the material is removed.

To attempt to make specific suggestion for operators on methods for solving scum problems is of questionable value, because no two situations are alike. Some ingenuity is required at each plant and operators have shown a high degree of skill in solving their own problems. However, a brief summary of ideas may be helpful.

Obviously, sufficient observations should be made to determine whether solids are accumulating to such a depth as to be troublesome. If that appears to be the case, measures may be applied to promote the digestion of the material. These may include increasing moisture content, circulation or stirring, and the addition of chemicals for pH control or to otherwise promote digestion.

When the situation is not brought under control by these measures, it may be advisable to remove some or all of the scum. It must be admitted that removal is not a final answer, as disposal after removal may be no small problem. Where incineration is provided, the material may be filtered and burned, with care being taken to control temperature in the furnaces. Drying on sand beds and disposal as fill is another possible method of disposal. Some effort in keeping the scum under control is worth while, as the emptying of a sludge tank is a major operation, particularly if it becomes necessary because of the accumulation of scum.

The heating of sludge tanks by hot water coils within the tanks has been common practice since the first use of separate digestion tanks. Although simple in design and operation, this method has not been entirely free of trouble. If the water is too hot, collection of solids on the outside of the coils impairs the transfer of heat. The pipes and their supports sometimes tend to retard the free flow of the sludge. Expansion and contraction of coils in large tanks requires consideration in design. Coils sometimes break and the emptying of a tank for repair of the coils becomes necessary. Mr. W. E. Gerdel reported a break in a heating coil at Cleveland in 1940[2] and J. W. Johnson has described repairing broken coils at Buffalo in 1943.[3]

Recently, the direct application of steam has been used successfully as reported by Mr. A. M. Rawn.[4] This method is worthy of consideration where steam is available. It does not apply so well where gas is used in engines because the waste heat from engine cooling water and exhaust is largely recovered at low temperature and must therefore be used as hot water.

The heating of sludge through some form of heat exchanger outside the sludge tank has been tried with only partial success. Heating in an open tank may produce objectionable odors. An exchanger involving passing sludge through small piping is subject to trouble from clogging. In a large plant now under design it is proposed to use an exchanger built

of 6-inch sludge pipe around which will be an 8-inch hot water jacket (see Fig. 1). This will be installed in the pipe tunnel between the source of sludge and the sludge tanks. The pipe is large enough to prevent clogging, the system is enclosed and will not produce odors, can be cleaned with steam or hot water, is accessible, and its use helps to keep the sludge tank clear. Equipment for direct application of steam is to be provided for use when insufficient heat can be obtained from waste heat from engines.

Conclusion

In this discussion of problems in handling sludge, specific statements or detailed recommendations on how problems should be solved have purposely been avoided. The wide range in characteristics of sludge and the differences in conditions and requirements at various treatment plants make it difficult to draw general conclusions from experience. An effort has been made to call attention to a few experiences and to comment upon some difficulties encountered and the remedies which have been used to overcome them. Additional descriptions of experiences, particularly relating to procedures which have coped successfully with sludge handling problems, will be helpful.

REFERENCES

1. W. H. Wisely, "The Operator's Corner," Sewage Works Journal, 13, 787-798 (1941).
2. J. W. Elims and W. E. Gerdel, 1940 Report of Division of Sewage Disposal, Cleveland, Ohio.
3. J. W. Johnson, "Sludge Digestion Tank Entered to Make Pipe Repairs," Civil Engineering, 14, 72 (1944).
4. A. M. Rawn, "Sludge Digestion Temperature Control with Live Steam," Water Works & Sewerage, 90, No. 6 246-248, 1943.

F. J. Reny Honored on 40th Anniversary at Portland

At the bottom of the letterhead of the Portland Water District is the statement "Portland's Greatest Asset — Pure Sebago Water." At the top of the letterhead is the name of F. J. Reny, Treas. and Gen. Manager—another great asset.

Recognition of Mr. Reny and testimonial to his services were recently accorded on the occasion of the 40th anniversary of his employment by the Portland Water Co.

At the testimonial held in his honor, Mr. Reny recalled the history of Portland Water in his four decades of service, partly with the private company and later with the Water District.

Starting in 1904 as an office boy, for the munificent salary of $1.25 per day, for a nine-hour day (shop men received $1.75-$2.00 for a ten-hour day) Joe's early chores included sweeping and dusting, filing, and more important, collecting delinquent accounts, and turning on or shutting off water, as necessary.

At the time the office force was all "cooped up in a little dark office at Plum St.—a building than which there has never been anything more unsuited for housing a public utility."

Two years later Reny was an inspector; "the work was easier and a bit more genteel," but Joe became more and more conscious of the growing public criticism of the water company.

Following a mass meeting of public-spirited citizens and a later vote to create a Water District, in 1907 the historic condemnation proceedings were begun, and young Joe had the opportunity to hear such famous engineers as Allen Hazen and Leonard Metcalf present data in the case.

Thus was Joe Reny imbued early with the idea of proper service to water consumers, and his work in the last several years is evidence of the fundamental concept of service implanted many years ago.

When the District officials assumed control of the works, Joe Reny was retained in his position of inspector, and as the system expanded so did his duties. In 1915, Reny was promoted to custodian of

F. J. Reny

the customers' journal, and the office was moved to its present location at 16 Casco St. Two years later Joe became registrar or teller, and was bonded for the first time. Another five years, and still young, Mr. Reny was office manager.

It was during the next ten years that many new innovations in office billing equipment were installed and this modernization has continued after Mr. Reny was made Treasurer and General Manager in 1933. One of the latest ideas is the microfilming of records, the story of which was told by Mr. Reny in *Water Works & Sewerage*, in Dec., 1943.

As F. J. Reny has grown in stature in the Portland Water District in 40 years, so too has the water system which, with a capacity of 75 mgd., now furnishes pure Sebago water through two huge 42 and 48-in. transmission lines. Portland has reason to be proud of its Water District and F. J. Reny.

At the dinner, service pins were given to all employes with twenty-year service or more. The group included 39 persons: two, 40 yrs.; six, 35 yrs.; eight, 30 yrs.; six, 26 yrs., and eight, 20 yrs. Long service speaks well for good management. The pin itself is the Portland Water District symbol of the "little man on the sprinkler wagon," with the number of years service indicated thereon.

"PIPE"

Ages ago beside a stream
A boy beheld a hollow reed;
Playing, he placed it, and the dream
Of pipe promoted with a weed.
He wished for one so long and strong
That water clear and cool could bring
The woodland hillside path along
To dwellings rude, from mountain spring.

How we depend on pipe today
Few people ever pause to think:
If from our ken 'twas borne away
What water would we dare to drink?
No gas and no electric power!
For engines—either oil or steam—
Depend on pipes, and serve each hour
Motors that move and lights that gleam.

Now railway trains and autos vie
With aeroplanes and buildings tall;
For pipes must be for buildings high
For elevators, heat, and all.
From pipes such modern blessings start
As health and heat and light and speed.
Thank God who taught men useful art
And showed one first a hollow reed.

—R. R. Howard*

*Sup't. of Utilities, Slater, Mo.
[Mr. Howard, titled by us the "Bard of the Missouri Water and Sewage Conference," has to his credit a number of poems. In our June, 1944 issue we printed his "WATER," and others will follow from time to time.—L. H. E.]

WATER AND SEWAGE PATENTS

(OF RECENT ISSUE)

WATER PATENTS

ROTARY WATER PUMP. John R. Hagstrom, Englishtown, N. J. U. S. 2,358,226; Sept. 12.

APPARATUS FOR TREATING LIQUIDS. Samuel J. Pugnatz, Hurleyville, N. Y. U. S. 2,358,591; Sept. 19. A water treating apparatus with a tank for liquid reagent, measuring devices and valves electrically operated when pumping apparatus operates.

CENTRIFUGAL PUMP. Alexey J. Stepanoff (to Ingersoll-Rand Co., N. Y.). U. S. 2,358,744; Sept. 19.

TREATMENT OF WATER WITH SOLUBLE DEHYDRATED SODIUM PHOSPHATES. Charles B. Durgin, Robert N. Foster and Charles F. Booth (to Monsanto Chem. Co., St. Louis, Mo.). U. S. 2,358,965. Sept. 26. The use of the water soluble fused reaction product of sodium meta-phosphate and tetrasodium pyrophosphate to prevent the deposition of alkaline earth metal compounds by hard water.

PIPE-LAYING TOOL. Robt. Landon Taylor, McEwen, Tenn. U. S. 2,359,261. Sept. 26. A pipe moving tool, substantially a T-shaped body with an elongated handle and crossarms at the forward end. To be used in moving and laying pipe.

METHOD OF PRODUCING COAGULUM FOR PURIFYING WATER. Orrin E. Andrus, Altadena, Cal. U. S. 2,359,280. Oct. 3. A method for producing aluminum hydroxide floc as a coagulant in water purification. Involves sterilizing some of the water by heat in the presence of an aluminum salt and the formation of aluminum hydroxide and soluble aluminum compounds with the impurities in the water and the subsequent decomposition of this soluble compound and precipitation of aluminum hydroxide.

PROCESS OF PURIFYING ALUMINUM SULPHATE SOLUTION. John H. Walthall (to Tennessee Valley Authority). U. S. 2,359,340. Oct. 3. A three step process for the removing of iron from aluminum salt solutions.

FLOW INDICATOR. Ernest W. Davis, River Forest, Ill. U. S. 2,359,467. Oct. 3. A transparent flow indicator in which a rotating helical member within the bore indicates flow.

FLUID-FLOW METER. Charles L. Stokes, Wallsend-on-Tyne, Eng. U. S. 2,359,592. Oct. 3.

VALVE. Frederick R. Venton and Murray A. Gleeson (to Crane Co., Chicago). U. S. 2,359,741. Oct. 10.

TREATMENT OF WATER SOFTENING SLUDGE. Robt. F. Clemens (to Dorr Co., New York City). U. S. 2,359,748. Oct. 10. A process for the separation in water softening of the precipitated calcium carbonate and magnesium hydroxide by subjecting the mixture to centrifugal force such that the calcium carbonate is removed as a cake and the magnesium hydroxide remains in the effluent suspension.

SEWAGE PATENTS

MEANS FOR CLARIFYING LIQUIDS. John Schaaf, Buffalo, N. Y. U. S. 2,358,736. Sept. 19. A filter composed of a plurality of funnel screens spaced apart to form chambers there between, means to rotate said filter, means to feed liquid over inner surface, means to sweep accumulated solids from said surface, means to hold filtering material in first chamber, means to add chlorine in the second chamber, means to feed air into the second chamber and means to hold activated carbon in the third chamber.

SEWAGE SCREENING SYSTEM. James D. Walker (to American Well Works, Aurora, Ill.). U. S. 2,358,841. Sept. 26. A screening system whereby the screen is backflushed clean by the lowering of the sewage on the upstream side by a pump operated both by a time cycle and by a float connected to the upstream well.

METHOD OF TREATING SUPERNATANT LIQUOR. Harry E. Schlenz and Clifford B. Cox (to Pacific Flush Tank Co., Chicago, Ill.). U. S. 2,359,004. Sept. 26. A method of treating supernatant liquor from anaerobic digestion tanks by means of aerating and settling the suspended solids in the supernatant liquor, returning the solids to the digestion tanks and the liquid to the sewage treatment process.

AERATION APPARATUS. Augustus C. Durdin III (24 per cent to Lewis H. Durdin and 52 per cent to Augustus C. Durdin, Jr). U. S. 2,359,025. Sept. 26. A porous diffuser for aeration of sewage and the like. Special construction contains a self-seating valve to prevent back flow into the header when the pressure is decreased.

APPARATUS FOR CONTINUOUS DIGESTION OF FIBROUS MATERIAL. Arthur E. Branzell, Lief Bloersen and John C. F. C. Richter (to Aktiebolaget Kamyr, Karlstad, Sweden). U. S. 2,359,543. Oct. 3. An apparatus for continuous digestion of fibrous material with means for adding the material, removing the digested solids, and removing the liquor at the top into an adjacent second digester.

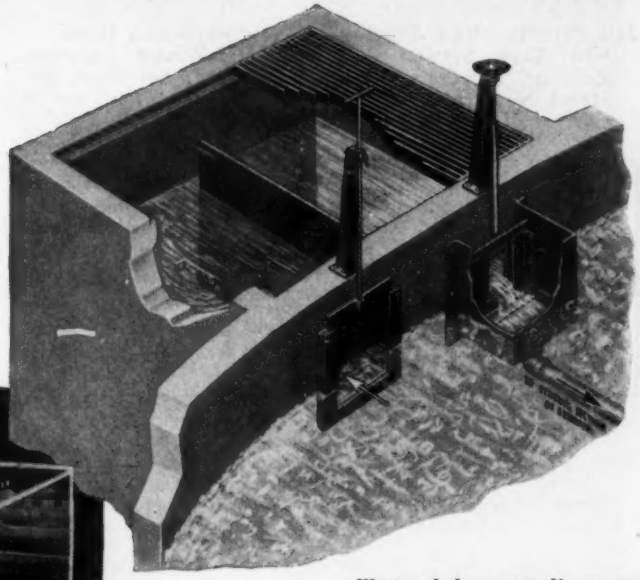
FILTRATION APPARATUS. Aloysius J. Devine and Edmund G. Smith (to Filtration Engrs., Inc., Newark, N. J.). U. S. 2,359,753. Oct. 10. A vacuum filtration system for operation in a slurry contained in a tub. Vacuum rotary drum is perforated and covered with a plurality of strands which pass over a transfer roll after leaving the drum.

SEWAGE TREATMENT METHOD AND APPARATUS. Augustus C. Durdin III, Skokie, Ill. (24 per cent to Lewis H. Durdin and 52 per cent to Augustus C. Durdin, Jr.). U. S. 2,360,551. Oct. 17. A method of treating sewage by directing the flow of sewage containing suspended matter in a regulated path to permit settling out of relatively heavy solids while maintaining the lighter solids in suspension, followed by straining the solids from the liquid, and returning a portion of the liquid to the incoming sewage to maintain a predetermined rate of flow.

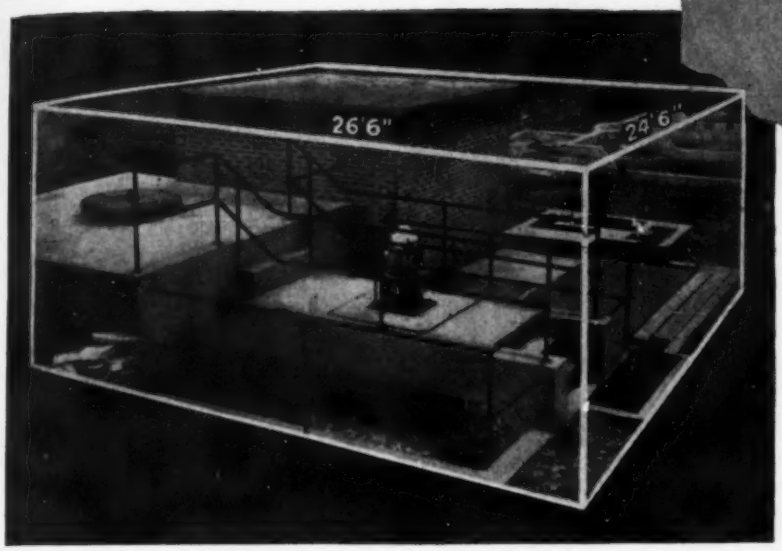
PROCESS FOR BIOLOGICAL TREATMENT OF SEWAGE TRADE WASTES AND THE LIKE. Weston Gavett, Plainfield, N. J. U. S. 2,360,769. Oct. 17. A continuous filtering process of several steps adapted to be carried out without interrupting the filtering process, consisting principally of a means for passing the liquid through a filtering medium and at the same time changing the filtering medium to maintain the biological film at its greatest capacity to treat the sewage.

CHICAGO "PACKAGE" SEWAGE PLANTS

WHAT ACCOUNTS FOR SIMPLE OPERATION AND CONSISTENT PERFORMANCE?



Waste sludge control* assembly, showing positive circulation through the waste sludge well.



Chicago "Package" Sewage Treatment plant at St. Mercy Sanitarium, Dyer, Ind. Design Capacity, 20,000 GPD. The Stationary Engineer of the sanitarium also operates the sewage treatment plant. The plant is composed of a Comminutor, primary tank, Combination Aerator-Clarified, pump house, digester and sludge beds.

- **WATER-CLEAR EFFLUENT**
- **NO ODORS**
- **SIMPLE TO OPERATE**

Purifying power of biologically activated sludge AUTOMATICALLY maintained proportional to varying sewage flow by hydraulic sludge control* without daily manual adjustment.

Positive circulation through the waste sludge well is maintained by connection to the venturi section of the aerator.

The flow of mixed liquor through the waste sludge well is proportional to the sewage flow. High sewage flows cause higher heads on the outlet weir, causing more mixed liquor to flow through the sludge well, and vice versa.

Only one simple adjustment of the single outlet weir regulates the proportion of the sludge to be wasted.

Due to a sudden decrease in velocity of mixed liquor in the waste sludge well, activated sludge settles. Therefore, sludge is wasted in proportion to the flow.

Concentrated sludge is withdrawn from the well by a time-clock-operated centrifugal pump.

*Patented

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Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs, Water Seal Pumping Units, Samplers.

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

MEETINGS SCHEDULED:

Jan. 17-1945—NEW YORK, N. Y. (Pennsylvania Hotel)
New York Section A.W.W.A. Mid-Winter Luncheon Meeting. Secretary, R. K. Blanchard, 50 West 50th Street, New York, N. Y.

Jan. 17-19—NEW YORK, N. Y. (Commodore Hotel).
American Society of Civil Engineers. (Annual meeting.) Secretary, George T. Seabury, 33 West 39th St., New York, N. Y. (All technical sessions and social events to be held at Commodore Hotel.)

Jan. 19—NEW YORK, N. Y. (Hotel Pennsylvania).
New York State Sewage Works Association. (Annual Meeting.) Sec'y-Treas., A. S. Bedell, % State Dept. of Health, Albany, N. Y.

Feb. 5-7—COLLEGE STATION, TEXAS (Texas A. & M. College).
Texas Water and Sewerage Short School. (Annual Short Course.) Secretary, V. M. Ehlers, Austin, Texas.

Feb. 8—ELIZABETH, N. J. (Winfield Scott Hotel).
New Jersey Section A.W.W.A. Sec'y, C. B. Tygert, Wallace & Tiernan, Box 178, Newark, N. J. (Spring Meeting June 8; Fall Meeting Nov. 8-10).

Feb. 13-14—PORTLAND, ME. (Portland Water District).
Maine Water Utilities Association. (Bi-Monthly Meeting). Sec'y-Treas., Earle A. Tarr, Supt. Water District, Winthrop, Me.

Feb. 15—BOSTON, MASS. (Hotel Statler).
New England Water Works Association. Secretary, Frank J. Gifford, 613 Statler Bldg., Boston, Mass. (Next meeting, March 15.)

Mar. 9-10—MINNEAPOLIS, MINN. (Nicollet Hotel).
Minnesota Section A.W.W.A. Sec'y-Treas., R. M. Finch, 416 Flour Exchange, Minneapolis, Minn.

Mar. 12-13—CHICAGO, ILL. (LaSalle Hotel).
Illinois Section A.W.W.A. Sec'y, O. T. Birkeness, 809 Washington Blvd., Chicago 7, Ill.

Mar. 15-16—LAFAYETTE, IND. (Purdue Memorial Union Bldg).
Indiana Section A.W.W.A. Sec'y, C. H. Bechert, 402 State Library Bldg., Indianapolis 9, Ind.

Mar. 19-21—MONTGOMERY, ALA. (Jefferson Davis & Whitley Hotels).
Southeastern Section A.W.W.A. Sec'y-Treas., B. P. Rice, Reconstruction Finance Corp., Atlanta, Ga.

Mar. 21-23—TORONTO, ONT. (Hotel Royal York).
Canadian Section A.W.W.A. Sec'y-Treas., Dr. A. E. Berry, Ontario Dept. of Health, Parliament Bldgs., Toronto, Ont.

Mar. 22-23—TRENTON, N. J. (Stacey-Trent Hotel).
New Jersey Sewage Works Association. (30th Annual Convention). Sec'y, John R. Downes, P. O. Box 11, Dunellen, N. J.

Mar. 29-31—SARASOTA, FLA. (Sarasota Terrace Hotel).
Florida Sewage Works Association. Sec'y-Treas., J. R. Hoy, 402 Hilderbrandt Bldg., Jacksonville, Fla.

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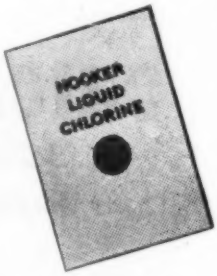

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6—Return activated sludge.
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Adequate velocity from "Spiralflo" movement—no sludge deposit on tank bottom. Activated sludge is returned from settling compartments to aeration compartment, and clear effluent is discharged. Waste activated sludge is returned directly to the primary tank.

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Apr. 5-6—COLUMBUS, OHIO (Hotel Fort Hayes).
Ohio Section A.W.W.A. Sec'y, L. J. Hoffman, 100 Municipal Bldg., Akron 8, Ohio.

Apr. 13-14—LEWISTON, MONT. (Hotel not selected).
Montana Section A.W.W.A. Sec'y, H. B. Foote, Dir. Div. San. Eng., State Board of Health, Helena, Mont.

Apr. 19-20—ELMIRA, N. Y. (Mark Twain Hotel).
New York Section A.W.W.A. Sec'y-Treas., R. K. Blanchard, 50 West 50th Street, New York, N. Y.

May 2—BOSTON, MASS. (Hotel Statler).
New England Sewage Works Association. (Spring Meeting). Sec'y-Treas., LeRoy W. VanKleeck, State Dept. of Health, Hartford, Conn.

May 7-11—ST. LOUIS, MO. (Municipal Auditorium).
American Water Works Association. (Annual Conference Secretary, Harry E. Jordan, 500 Fifth Ave., New York 18, N. Y. [Reservations at Jefferson, Statler and ten other selected hotels made only through Housing Bureau, Hotel Association, 910 Syndicate Trust Bldg., St. Louis, Mo.]

May 18-19—GEARHEART, OREGON (Gearhart Hotel).
Pacific Northwest Section A.W.W.A. Sec'y, Fred Merryfield, Assoc. Prof. Civ. Eng., Oregon State College, Corvallis, Ore.

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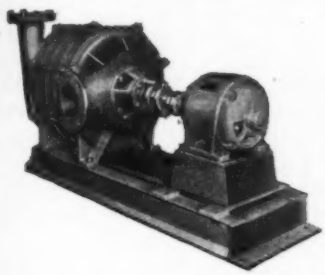

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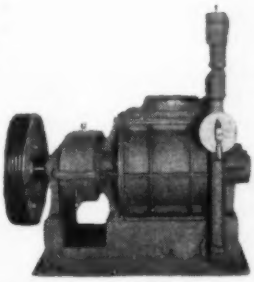

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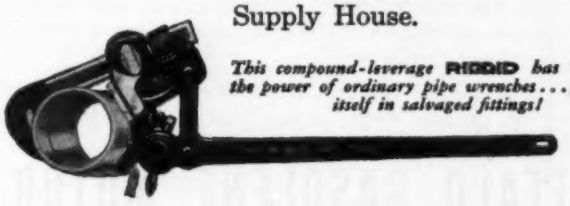

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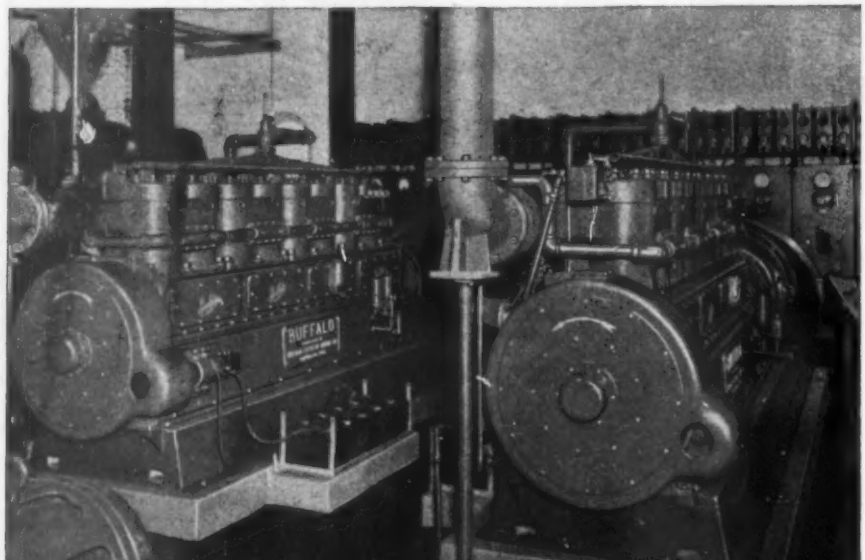

Lake Kilby Pumping Station, City of Portsmouth, Va. Two—ATT-8 Buffalo Gasoline Engines, each driving 300 KW, 1200 R.P.M., G. E. generators, installed by Dravo Corporation, 1943.

TO omit stand-by engine and pumping equipment invites trouble. When regular power service fails, the best to be hoped for is a flood of complaints from customers, taxpayers, or voters—and the worst is the risk of serious fire or epidemic.

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Here and There with Doc Symons

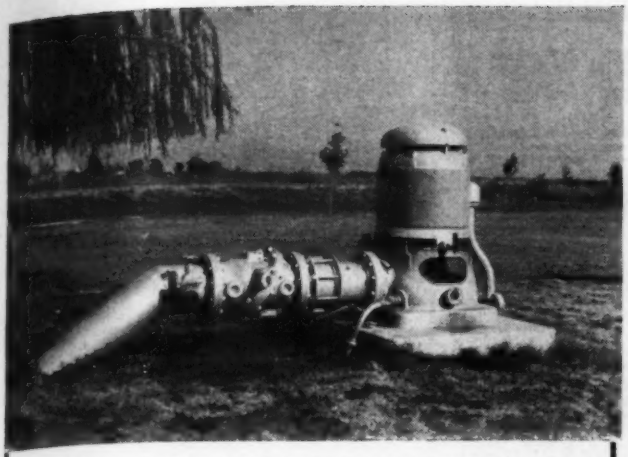
IT'S A NEW YEAR and time for resolutions, or at least time to take stock of one's ideas; to discard those worn out and consider new ones. May I impinge on your consciousness for a moment to give you something I think you should think about in this next year.

Take the American and English system of weights and measures. Thoroughly out of date, isn't it? Why shouldn't we take up the metric system right now or at least at the end of the war. The Army has for its guns, the Navy hasn't. We have a decimal system for money and laugh at the British conglomeration of shilling, pounds, and pence, but we cling to feet, inches, yards, knots, two kinds of miles, two kinds of tons, bushels that depend on the substances measured, three kinds of ounces, and—you go on.

And that Fahrenheit system of temperature—phewy! Why not Centigrade? In water and sewage treatment we use parts per million without batting an eye—parts per million, i.e., milligrams per liter—all of our analytical data are based on analyses reported in the metric system, and then we "haul off" and convert the data into pounds per million gallons—silly, isn't it?

And while we're making changes how about accepting the thirteen month-calendar? The present calendar isn't correct anyway; it's confusing, has a thousand arguments against it, and the only reason for it is the resistance of human beings to change and advancement.

One of my resolutions for this year is to publish an article on the thirteen-month calendar and its advantages. It sure would be a help in figuring monthly averages, and that decimal system of weights and measures wouldn't slow your calculations either, brother. And then we'd be rid of those fellows who use 8⅓ lb.



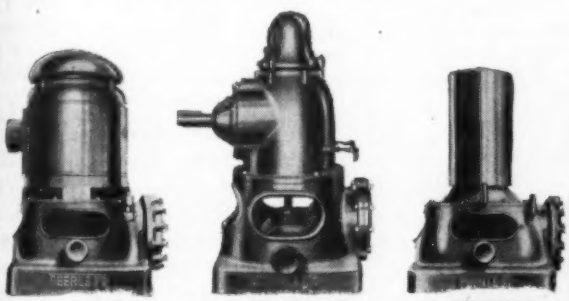
Peerless 60 H. P. Turbine Pump providing 1700 G.P.M.

Let's look ahead to your city's water needs

Engineers in city water departments are cognizant of the future needs of their city for water. In some places, lowering water levels require additional pumps or heavier duty pumps to offset the condition. Growing population or new building projects now and in the postwar period bring anticipation for new pumping equipment. Peerless engineers are closely working with city officials in countless communities checking needs for the future, making recommendations as to the type of pump best suited for each condition.

If you require a new pump (oil or water-lubricated) or would like to know more about how to step up your water supply, we will be glad to confer with you.

Capacities: 10 to 220,000 gallons per minute.



MOTURO GEARTURBO BELTURBO

PEERLESS PUMP DIVISION — Food Machinery Corp.

★ WATER OR OIL LUBRICATION

Peerless

TURBINE PUMPS

PERFORMANCE WITH ECONOMY

Also Hi-Lift & Hydro-Foil Types

Factories:
301 W. Ave. 26, Los Angeles 31,
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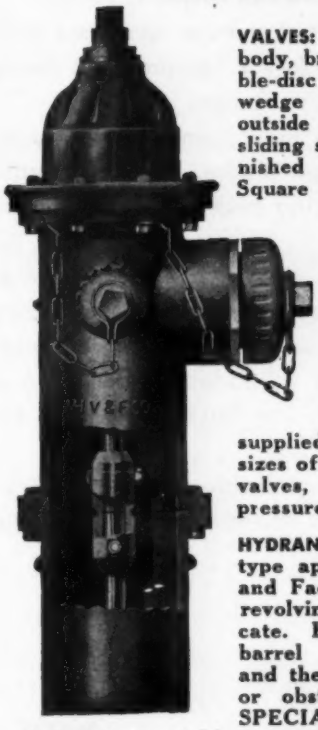
and Canton 6, Ohio

The Sign of QUALITY!

VALVES HYDRANTS



VALVES: A.W.W.A. type, iron body, bronze mounted with double-disc parallel seat or solid wedge type. Non-rising stem, outside screw and yoke, or with sliding stem and lever. Also furnished hydraulically operated. Square bottom type operates in any position. All rugged and dependable, made of best material with highest quality workmanship.

Hydraulically Operated: For remote control of operation and for quicker, easier opening or closing. Can be supplied in any of the standard sizes of M & H A.W.W.A. gate valves, either high or low pressure.

HYDRANTS: Standard A.W.W.A. type approved by Underwriters and Factory Mutuals. Dry top, revolving head, easy to lubricate. High efficiency because barrel diameter not reduced and there are no working parts or obstructions in waterway. SPECIAL TRAFFIC MODEL is designed to yield at ground line under impact, repair being simply renewal of breakable bolts and breakable coupling on stem.

Write for Catalog No. 34

M & H PRODUCTS INCLUDE

FIRE HYDRANTS	SHEAR GATES
GATE VALVES	MUD VALVES
TAPPING VALVES	VALVE BOXES
WALL CASTINGS	FLAP VALVES
SPECIAL CASTINGS	SLUDGE SHOES
TAPPING SLEEVES	FLANGE AND FLARE FITTINGS
CHECK VALVES	FLANGED FITTINGS
FLOOR STANDS	B & S FITTINGS
EXTENSION STEMS	CUTTING-IN TEES

M & H VALVE AND FITTINGS COMPANY

ANNISTON, ALABAMA

Get a Royer NOW!

—be Ready for Sludge Fertilizer Sales this Spring

Royer "Jr." model with gasoline engine for power.

Sludge fertilizer prepared by the Royer Sludge Disintegrator is increasing food production in every part of the United States, and at the same time providing a substantial revenue for sewage disposal plants.

At an ever-growing list of sewage treatment plants, in communities large and small, the Royer has replaced the incinerator or the labor required to bury the sludge.

The demand for more food from America necessitates the use of more fertilizer. Sewage sludge has high fertilizing value, but the wet cake in your drying beds is hardly in condition for use as a soil builder.

The Royer thoroughly shreds, mixes, aerates and further dries the sludge. Sticks, stones and trash are automatically removed. The machine discharges onto pile or truck an effective, ready-to-use fertilizer. Chemicals may be added, in the same process, to make a high strength fertilizer. The Royer soon pays for itself from fertilizer sales.

Twelve stationary and portable models; electric motor, gasoline engine and belt-to-tractor driven. Send for "Sewage Sludge Utilization Datalog."

Royer Model NSC-2, electric motor powered, at Wausau, Wisconsin, where a large part of the sludge fertilizer is used in the city parks.

THE ROYER FOUNDRY & MACHINE CO.
170 PRINGLE ST., KINGSTON, PA.
PIONEERS IN THE SALVAGE OF SEWAGE SLUDGE

for a gallon of water instead of 8.345 lbs.

* * *

Dick (General Chemical) Ockerhausen, another devotee of the *N. Y. Daily News-Chicago Trib.* comic strips, 'phoned in the other day to say that he read the following in Danton Walker's Column of Dec. 26—"Charlie Hoover writes from India that Hitler's secret weapon out there must be the drinking water; it's that foul."

Dick said that was the first he'd heard that Charlie had left Columbus, Ohio. (Watch your inflection, Dick; that could be libel.)

* * *

ANCIENT AND HONORABLE ORDER OF SEWER RATS OF ONTARIO
Christmas Dinner Menu—1944
Celery and Olives
Roast Young Gosling au Gravy
Pommes de terre a la Duncan
Cabbage de Savoy
Crabapple Jelly
Mince, Raisin, or Apple Pie
Tea, Coffee or Milk
Cider from Ye Olde Still
on tap at all times

* * *

Abel Wolman and Linn Enslow, honorary members of the AAHOOSROO were toasted in absentia, and I received honorable mention in Apple Jack, according to the Pie Eyed Piper. Helen Ball read some of her verse—not bad either. P.S., the husbands cooked the meal.

* * *

There has not been space before to tell you here, that the Annual Banquet of the Fed. of Sew. Wks. Assns. at Pittsburgh was a birthday dinner for Bill Piatt, of Durham, N. C. Somehow Harry Schlenz knew it in advance and had a cake with candles at Bill's place. Sixty-five years seem to rest well on his shoulders. Wish I could tell you a couple of jokes that Bill told me at dinner the night before but, while they are clean enough, they wouldn't do so well in Bill's solid south. After talking with Bill in 1940 and in 1944 I'm looking forward to the Federation meeting in 1948 when another election will be on. Hope I can get Al Genter, Gordon Fair and Bill together again. Bill sure holds his own among the Damyankees.

Take 2 lengths of Standard grooved pipe

. . . add one Victaulic Coupling . . .

and you've got a leak-tight, flexible, expansion joint,

QUICKER THAN ANY OTHER METHOD

Save man hours, save money! One tool does all the work, a speed socket wrench. Coupling centers automatically on pipe and the housing floats in pipe end grooves . . . allowing freedom of movement for temperature changes, eliminating need for accurate alignment of pipe lines. With Victaulic there's a UNION at every joint . . . and every joint is mechanically locked, positive, slip-proof, leak-tight under pressure or vacuum.

If you have piping problems, you'll find all the answers pertaining to your industry in our new Victaulic Catalog and Engineering Manual. Write on your firm's letterhead for your copy today. VICTAULIC COMPANY OF AMERICA, 30 Rockefeller Plaza, New York 20, N. Y.; Victaulic Inc., 727 West 7th Street, Los Angeles 14, California; Victaulic Company of Canada, Ltd., 200 Bay Street, Toronto.

WAR BONDS
A PIPE LINE FROM YOU TO HIM

VICTAULIC

Reg. U. S. Pat. Off.

SELF-ALIGNING PIPE COUPLINGS AND FULL-FLOW FITTINGS

OIL MINING MARINE MUNICIPAL INDUSTRIAL

SMITH
INSERTING VALVES

THE A.P. SMITH MFG. CO. EAST ORANGE, N.J.

Symbol of Quality Since 1889

NO SHUT-DOWNS NECESSARY!

Water shut-offs mean Industrial shut-downs, and this in turn impedes the war effort. These shut-offs are not necessary when a valve insertion is made.

With a Smith Valve Inserting Machine you can insert valves with the service at full pressure. These machines are made in 6 sizes for inserting 4" to 36" valves, are simple and easy to operate and do a surprisingly quick, clean job.

Showing a 24" valve installed horizontally under pressure.

OTHER SMITH PRODUCTS

Valves and Hydrants — Valve Inserting Machines — Tapping Sleeves — Tapping Valves — Hat Flanges and Water Meters

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524 First Ave. S., Seattle, Wash.
1317 Oakley St., Orlando, Fla.

THE A. P. SMITH MFG. CO., EAST ORANGE, N. J.

Sorry, I forgot to tell you last month that my old friend and one time mentor, Jesse K. Giesey has been appointed Superintendent of Operations of the Toledo, Ohio, Water Department. I first worked under Jess at Evansville, Ind., and then used to see him quite often when he was in charge of the construction of the Bird Island Sewage Treatment Plant at Buffalo, and I was running the experimental laboratory. Jess used to razz the devil out of Jim Rumsey and me about operating the plant before it was built for we were always in a gab-fest about it. I remember when Jess left Buffalo to go to Toledo as Division Engineer to construct the new Lake Erie water intake. I got even with him at the farewell dinner with a bit of verse dedicated to his ability to handle the profane language. I still take my hat off to his prowess in that dept. He should make a great superintendent.

* * *

After last month's column, do I dare mention that maybe it isn't always the best thing to keep a technical program right up to the *minute* and on time. In L. A. at the California Section meeting, one of the sessions *was* right up to the minute when the last paper was scheduled to go on. But the speaker, Mr. Coupal, was not present—not quite that is, for he was frantically trying to pick up some slides for his talk to replace those previously made but lost in the mail. Breathless, Mr. Coupal arrived at the meeting *five minutes* late—to find an empty hall. Not knowing Mr. Coupal's whereabouts the Chairman had adjourned the meeting. There were quite a number of persons including Mr. Coupal who were disappointed but the paper will be read next year. Maybe technical meeting

LIQUID CHLORINE

100 lb. and 150 lb. cylinders
New York Metropolitan Area deliveries

E. M. Sergeant Pulp and Chemical Co., Inc.
Empire State Building
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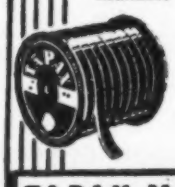
TAPAX

The ORIGINAL *and* FINEST....



Manhole Cushion U. S. Pat. No. 2,050,050 offers you the simplest solution for noisy, rattling covers. Easy to install. Lasting — Economical.
Write for story of Tapax and Trial Offer.

TAPAX MFG. CO., INC.
MAMARONECK NEW YORK

SAVE MONEY USE ACTIVATED ALUM and BLACKALUM

STUART-BRUMLEY CORP.
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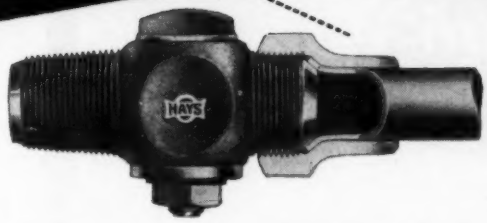
SEVENTY-SIX YEARS HAYS DEPENDABLE SERVICE

COPPER SERVICE METHOD

Assures { SIMPLICITY SAFETY ECONOMY



WITH the gradual relaxation of priorities, copper is becoming available for water service. Hays, a pioneer in the development of copper pipe services, has developed and built a complete line of stops and fittings for use with copper pipe. The use of copper pipe and Hays Radius Seal Joints eliminates much labor in installation. It simplifies the making of tight, vibration proof connections which together with its long functional life, without attention or replacement, provides the utmost in economy.

Illustration shows a Hays corporation stop with Hays Radius Seal Joint. This popular joint features a 45° machined seat and pipe flare and is available directly on Hays Corporation and Curb Stops, Service Connections, Goosenecks, Branches, Adapters, Stop and Drains, etc. All Hays Radius Seal Fittings are interchangeable with other makes. Dimensional accuracy and uniformity of threads permits the use of Hays Brass in any standard tapping machine. Hays Water Service Brass Goods Catalog shows illustrations and gives full descriptions. Send for your copy.

BE SURE TO REPLACE WITH ANOTHER HAYS STOP

SEVENTY-SIX YEARS HAYS DEPENDABLE SERVICE

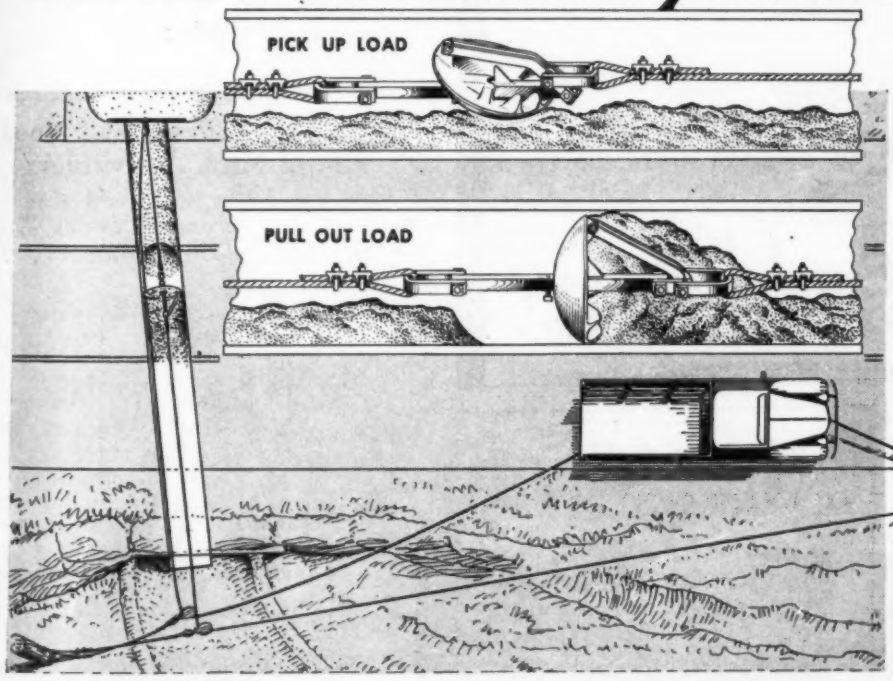
COPPER · BRASS · LEAD IRON

WATER WORKS PRODUCTS

HAYS MANUFACTURING CO., ERIE, PA.

Buy More War Bonds

Storm drain cleaning MADE EASY WITH NEW "FLEXIBLE" CULVERT SCRAPER



Storm drain cleaning is a simple operation with the Flexible Hi-Way Culvert Scraper. The cable lines are strung, as shown, from a telephone pole or "deadman" through the culvert to a pulley anchored by a timber placed across the end of the culvert.

ACTION! When truck moves forward the collapsed tool is pulled into the culvert; backing up opens the tool and drags out a load of sand and debris.

The Flexible Hi-Way Culvert Scraper is equally effective for sanded sewer lines where flow water is not available. Sizes from 10" to 36". Write for catalog.

615 Pickwick Bldg. Kansas City 6, Mo.
1624 Harmon Place Minneapolis 3, Minn.
P. O. Box 694 Gulfport, Miss.
41 Greenway St. Hamden, Conn.

FLEXIBLE SEWER-ROD EQUIPMENT COMPANY

9059 Venice Boulevard Los Angeles 34, California

401 Broadway New York 13, N.Y.
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P. O. Box 694 Pittsburgh, Pa.
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The *Coagulant* that *Cuts Costs!*

TENNESSEE CORPORATION Ferri-Floc

Ferri-floc . . . the ferric coagulant that is successfully and economically used in sewage treatment throughout the United States. Take advantage of modern plant research and findings: use Ferri-floc. Tennessee Corporation's technical staff will be glad to help you with your specific problems. Write to us today. The consultation service is free, of course.

The Mark of Quality

TC TENNESSEE CORPORATION

Tennessee Corporation

ATLANTA, GEORGIA LOCKLAND, OHIO

STOP JOINT LEAKAGE WITH CARSON CLAMPS

AND MECHANICAL JOINTS

Charcoal iron bolts for Cast Iron Pipe and Fittings. Write for Prices.

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DIAPHRAGM PUMPS

Hand Sizes 2", 2½", 3", 4"
Power Sizes 3" and 4"
Open Discharge or Force Pump
Edson Special Suction Hose
Red Seal Diaphragms
Strainers and Foot Valves
Hose Spanners—Adapters

THE EDSON CORPORATION

Main Office and Works: 49 D St. South Boston, Mass.

New York: 142 Ashland Pl., Brooklyn

time tables should be allowed to run late—well, five minutes late, anyway.

* * *

Out at Purdue University at the Ind. Waste Util. Conf. put on by Don Bloodgood, I spotted a few more gray hairs in Cecil Calvert's head. Seems as though someone, upstream from his Indianapolis Water Plant, had dumped a bit of cyanide in the stream; too much for the fish and, had it reached his intake, too much for the consumers. Fortunately, all of Cecil's preparations to treat the cyanide slug when it arrived were not needed as biological action and dilution reduced the lethal stuff to a less than toxic quantity. The story reminded me of the time I "made" the Pathe News Reel wading about in the acres of dead fish killed by an industrial poison reaching Niagara's waters.

* * *

And then there was the man who wanted to try that *cathartic* protection for his water tank.

MANUFACTURERS' *and* EQUIPMENT News

Everett Jones Pres., Ted Wood V.P. of Mfrs. Association

On Nov. 29th, the Board of Governors of the Water & Sewage Wks. Mfrs. Assn. held a meeting to elect

Everett M. Jones

a president to fill the vacancy created by the untimely death of Charlie Becker. As president, the Board chose former Vice President Everett M. (Casey) Jones, General Manager, Simplex Valve and Meter Co., Philadelphia.

As vice president to fill the

vacancy created by the elevation of Mr. Jones, the Board of Governors elected Theodore V. Wood, Sales Manager, Pipe Dept., R. D. Wood Co., Philadelphia.

"Gerry" Manahan Made Sales Mgr. of A. P. Smith

Announcement has been received from the A. P. Smith Mfg. Co. that, effective Jan. 1, 1945, Gerald J. Manahan was appointed General Sales

"Gerry" Manahan

Manager to succeed Thomas L. Halpin, who had to resign because of an eye ailment.

Mr. Manahan has represented the company for a number of years as Sales Engineer in the New England territory, where he made many friends for his company. He has also had experience in a municipal water department and in the Water Works Equipment & Supply Co.

"Gerry" Manahan will be succeeded in New England by Frank F. Wells, formerly of the New England territory of the Transite Division of Johns-Manville. The New England Sales Office of the A. P. Smith Co. will be located at 54 Wells St., Melrose, Mass.

Recent Changes at Dorr

Important appointments in the Sanitary Engineering Division of The Dorr Co. have been made to keep pace with post-war planning activities and to use the limited staff to best advantage.

Fred G. Nelson, Assistant Man-

Fred G. Nelson

DEPENDABLE GAS STORAGE FOR Peak demands

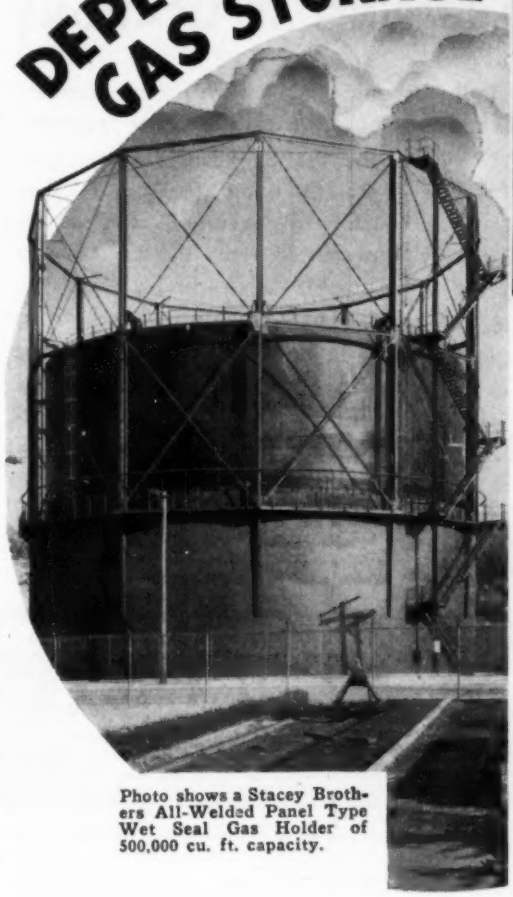
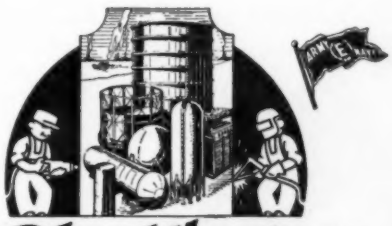


Photo shows a Stacey Brothers All-Welded Panel Type Wet Seal Gas Holder of 500,000 cu. ft. capacity.

If your municipality operates its own manufactured or natural gas plant or sewage treatment plant—you will be interested in Stacey Brothers Gas Holders for storing the gas to meet emergency of peak demands.

The Stacey Brothers Gas Construction Company is one of the oldest, as well as the recognized leader in designing and supplying gas holders throughout the Western Hemisphere. The performance records of our holders stamp them as outstanding for dependability, economy, and long service. We produce both wet and dry seal types for low pressures, and various high pressure types. Write for complete information.



The STACEY BROS. GAS CONSTRUCTION CO.
One of the Dresser Industries
5535 Vine St., Cincinnati 16, Ohio

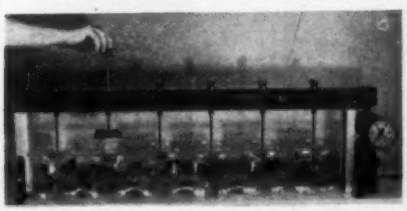
Stacey Brothers GAS HOLDERS
ENGINEERS · FABRICATORS · RECOGNIZED EXPERIENCE & FACILITIES

ZECO GREENSAND ZEOLITE

ZECO and HI-ZECO Greensand Zeolite for water softening, filtration and iron removal. ZECO Manganese Zeolite for iron and manganese removal. COREXITE mineral for corrosion control and water stabilization.

ZEOLITE CHEMICAL CO.
Sales Office: 140 Cedar St., New York, N. Y.
Factory: Medford, N. J.
Pioneer Producer of GREENSAND ZEOLITE MINERAL

THE *Phipps & Bird* LABORATORY MIXER . . .



IS the important piece of equipment in the Modern Water Works Laboratory. Now being used by leaders in water works research. Many superintendents and chemists have been able to reduce their chemical costs by the control of chemical dosages with this mixer. Write for literature.
PHIPPS & BIRD, INC. Richmond, Va.

THE *Bailey Synchro-Meter* GIVES YOU *Flexibility* IN METERING APPLICATIONS

● This meter panel includes both direct mechanically operated Fluid Meters and Bailey Synchro-Meters, which are electrically operated by remote transmitters.

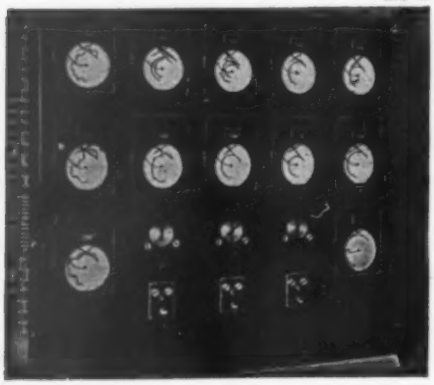
Wherever you have need for a central meter panel incorporating both mechanically and electrically operated Fluid Meters, it is possible to maintain uniformity and neatness by employing this system of transmitting meter and recorder readings.

Readings of flow, pressure, temperature, liquid level and other factors are accurately and quickly transmitted from out-of-the-way places to the receiving indicator, recorder or integrator by the Bailey Synchro-Meter.

This electrical mechanism which is completely described and illustrated in Bulletin No. 194-A, can also be used to eliminate the necessity of running high pressure piping up to meter and control panels.

Write for your copy of this new Bulletin.

MU-17



BAILEY METER COMPANY

1072 Ivanhoe Road, Cleveland, Ohio

BAILEY METER COMPANY LTD., MONTREAL

THE DOW CHEMICAL COMPANY

MIDLAND MICHIGAN

ager of the Sanitary Eng. Div., has been transferred to Los Angeles and appointed Manager of the Western territory. O. V. Lindell has been transferred from Kansas City to Chicago and appointed Manager of the Central Territory. The office in Kansas City will continue to serve the Southwest. W. A. Darby continues as Manager of the Eastern Territory.

Sudrabin Now with Electro-Rustproofing

Lee P. Sudrabin, formerly associated with the Dayton Power and Light Co. of Dayton, Ohio, has become Chemical Engineer with the

L. P. Sudrabin

Electro-Rustproofing Corp. in Dayton.

Mr. Sudrabin, who has a broad background in electro-chemical engineering, first became associated with the company as a consultant when he undertook to study Cathodic Protection at the Westport Mill Laboratories of the Dorr Co. The story of these studies and the application of the Rustop System of Cathodic Protection is being written for *Water Works and Sewerage* by Mr. Sudrabin and the first of the series of articles appears in this issue.

Coey to Manage Hooker's Sales Development

The Hooker Electrochemical Company announces the appointment of John S. Coey as manager of its Sales Development Department at

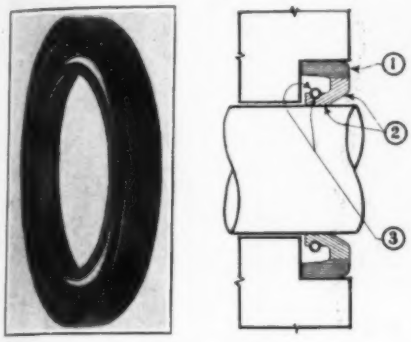
John S. Coey

Niagara Falls, N. Y. Prior to this promotion, Mr. Coey was an assistant in this department. In 1937 he joined the Hooker technical staff in charge of the Process Study Group working on the improvement of processes and products. A graduate chemist from Amherst College, Mr. Coey is well equipped to give helpful technical assistance to the chemical industries served by Hooker.

"Clipper Seals"

Something New in Oil Seal Rings

In answer to the need for a new oil seal having a high factor of heel rigidity without the use of metal, and greater flexibility in the lip, Johns-Manville has brought out a



"Clipper Seal"

Design which is used on the ordinary oil seal job entailing nominal pressures up to 40 lbs.
(1) Rigid heel to provide press fit in the cavity.
(2) Soft flexible compound lip to conform to shaft.
(3) Garter spring to attain positive and controlled pressure of lip on shaft.

new bearing protector known as the "Clipper Seal."

This seal is made with a heel of resin bonded fabric which gives it the rigidity essential for a press fit in the cavity and with a lip of tough but soft flexible compound.

Advantages include precision mold without resorting to the use of metal; greater bore tolerances permissible; and no scoring of metals

Portsmouth, Va., with a heavy influx of Navy Yard workers, increased its water supply from 6,000,000 to 13,000,000 gallons per day by building a 13-mile water line of 30-in. concrete pipe. Laying crew placed 400 ft. of pipe daily.

Water and sewerage projects need the durability and economy of

CONCRETE PIPE

Concrete pipe has proved its durability on a vast scale, with installations dating back half a century and more. It fully meets ALL the requirements of moderate first cost, structural safety, minimum infiltration and leakage, and maximum hydraulic capacity.

Technical information about concrete pipe or other concrete construction is available to engineers and builders engaged in sewerage, drainage or water supply projects.

PORTLAND CEMENT ASSOCIATION

Dept. A 1-29, 33 W. Grand Ave., Chicago 10, Ill.

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

★ ★ ★ BUY MORE WAR BONDS ★ ★ ★

ANTHRAFILT

A Filter Medium For All Purposes

ANTHRACITE EQUIPMENT CORP.

101 Park Ave. New York

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STATE COLLEGE, PA.

CONTRACTS

Completely Installed

Water Works and Sewerage Plant Equipment

Turbine Equipment Co.

75 West St.

New York 6, N. Y.

. . for ACCURACY and TROUBLE-FREE OPERATION

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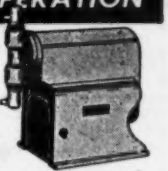
WILSON

HYPO-CHLORINATOR



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CHEMICAL FEEDERS, INC.

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"The Pace Setter"

EVERY "Varec" APPROVED GAS CONTROL INSTALLATION IS DESIGNED FOR YOUR Individual TREATMENT PLANT

The "VAREC" Engineering Department and Laboratory will always collaborate with you on your individual Treatment Plant Gas Control Systems. Thus, your "VAREC Custom Built" installation guarantees you 100% efficiency and performance.

Fig. No. 440. The New "VAREC" Approved Pressure Relief and Flame Trap Assembly.

This unit consists of a diaphragm-operated regulator, flame-trap and a thermal shut-off valve. It maintains a pre-determined back pressure, passing surplus gas to the waste gas burner. It stops flame propagation. Non-corrosive in sewage gas.

OTHER "VAREC" PRODUCTS

Flame Trap Assembly, Pressure Relief and Vacuum Breaker Valves, Flame Arresters, Waste Gas Burners, Flame Checks, Regulators, Check Valves, Sediment Traps, Drip Traps, Manometers, Explosion Relief Valves, Handhole Covers, and Sampling Hatches.

The Vapor Recovery Systems Company
COMPTON, CALIFORNIA
Branch Offices and Stocks Carried at
N. Y. City; New Orleans, La.; Tulsa, Okla.; Houston, Tex.
AGENCIES EVERYWHERE

forming seal cavity. Clipper seals can be furnished split if required to avoid disassembly of equipment when renewing seal. Further information and descriptive literature can be had from Johns-Manville, 22 E. 40th St., New York 16, N. Y.

Federal Water Meter Discontinued

Effective Jan. 1, 1945, the A. P. Smith Co. has announced the discontinuance of manufacture of the line of Federal Water Meters. Adequate spare parts will be maintained for customers, however. This cessation of manufacture advented with direct contracts by the meter division for war materials in 1942. Bronze limitations of WPB likewise prevented the manufacture, and continued war orders preclude the return to meter manufacture at this time, even under the recent release of bronze for that purpose.

The company has therefore decided, with reluctance, to withdraw from the meter field and concentrate on other products for which they are better known.

"Duraplastic"

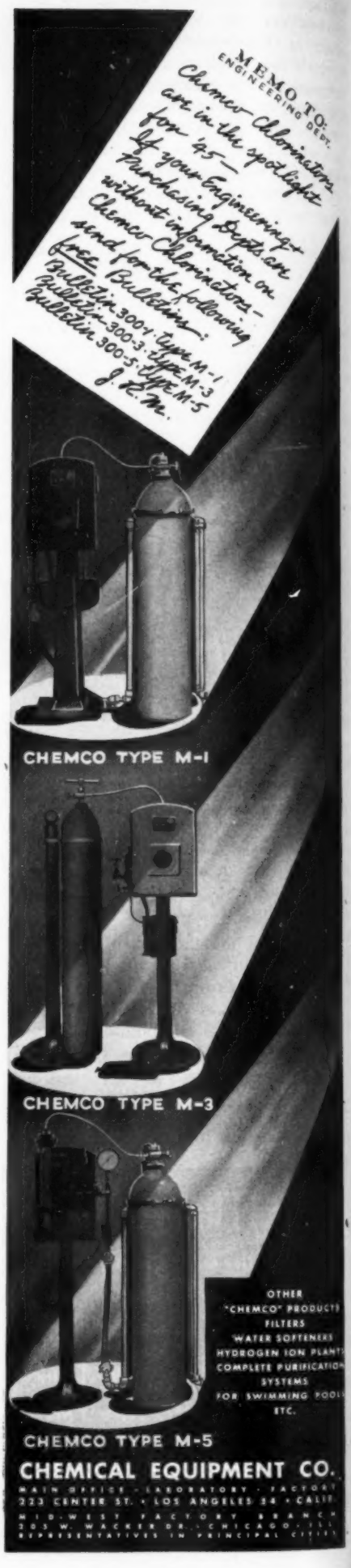
A Modified Cement Productive of Concrete of Improved Characteristics

The development of an air-entraining portland cement by Universal Atlas Cement Co. is set forth in an interesting booklet from the same company which bears the title, "Atlas Duraplastic"—a new cement which makes concrete more durable and more plastic.

Revealing the nature and characteristics of air-entraining cement, the book defines Atlas Duraplastic as a true Portland cement in which there has been interground during manufacture a small but precise amount of air-entraining material needed for satisfactory field performance. It complies with Federal and ASTM specifications and sells at the same price as normal cement.

"Duraplastic" was originally developed about 6 years ago as a cement which would make concrete highly resistant to the effects of freezing and thawing weather and to the scaling caused by repeated applications of salts used for deicing of concrete paving. However, the same characteristics that made this non-scaling cement superior for paving are also highly desirable in other fields of concrete work.

No longer in the experimental stage, its use, as illustrated in the book, has extended to houses, sidewalks, tanks, foundations, buildings, retaining walls, block and pipe. Ex-


MEMO TO: ENGINEERING DEPT.
Chemco Chlorinators are in the spotlight for '45—
If your Engineering Dept. is purchasing Chlorinators without information on Chemco Chlorinators—send for the following free Bulletins:
Bulletin 300-1 Type M-1
Bulletin 300-3 Type M-3
Bulletin 300-5 Type M-5
J. R. M.
CHEMCO TYPE M-1
CHEMCO TYPE M-3
CHEMCO TYPE M-5
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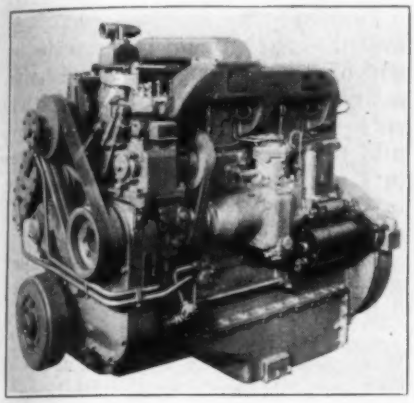
FILTERS
WATER SOFTENERS
HYDROGEN ION PLANTS
COMPLETE PURIFICATION SYSTEMS
FOR SWIMMING POOLS ETC.
CHEMICAL EQUIPMENT CO.

perience is given as evidence that Duraplastic cement requires less mixing water for a given slump; that it makes concrete that is more workable and more uniform, and one that spreads, screeds, and finishes more easily.

Copies of the "Duraplastic" booklet are available upon request to Universal Atlas Cement Co., 135 E. 42nd St., New York 17, N. Y.

Cummings New High Speed Diesels

Cummings Engine Co. of Columbus, Ind., has announced the development of a new series of engines which continue the trend



toward "more power per pound through high speed diesels."

Series NH-600 and NHS-6000 Cummings Dependable Diesels are higher speed and higher horsepower versions of the model H and its supercharged counterpart Model HS. The increased output is obtained by these innovations; by increasing operating speed from 1800 to 2100 rpm., by increasing bore and stroke and by employing dual intake valves and dual exhaust valves.

Further information on these new series of diesels may be obtained from an illustrated brochure (Bull. 5206-1) published by Cummings Engine Co., Inc., Columbus, Ind.

Constant Level Lubricator

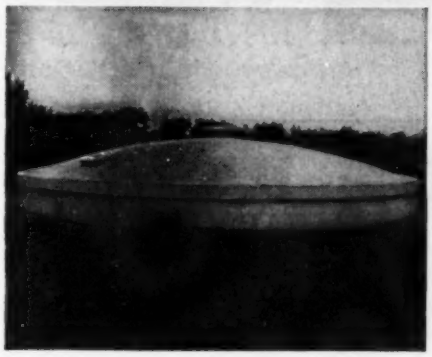
Visible, reliable, automatically controlled, the Constant Level General Purpose Lubricator has been developed by Oil-Rite Corp. of Milwaukee, Wis. Used on machines, line shafting, electric motors, etc., it needs filling only at periodic intervals. A mere glance at the reserve supply tells when filling is necessary.

Operation of the new lubricator depends on the principle of liquids seeking their own level. When the

CEMENT GUN COMPANY

"GUNITE" CONTRACTORS

GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.



"GUNITE" WATER TANK

The tank shown was built by us in 1938 for the city of Oglesby, Ill., in association with the Wells Engineering Co., Consulting Engineers.

The tank is built entirely of reinforced "GUNITE," with self-supporting domed roof and inverted domed bottom. It is 50'-0" diameter, 16'-0" deep from the bottom to the water line, and the capacity is 200,000 gal. A similar tank of 325,000 gal. capacity was built by us for the town of Oakland, Md.

Our Bulletin 2200 shows a wide variety of "GUNITE" reservoir work done by us, as well as numerous profitable uses of "GUNITE" in every branch of construction. Write for a copy!

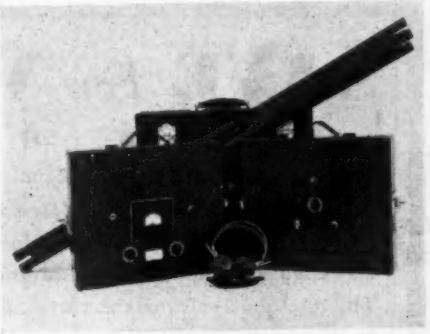
MANUFACTURERS OF THE "CEMENT GUN"

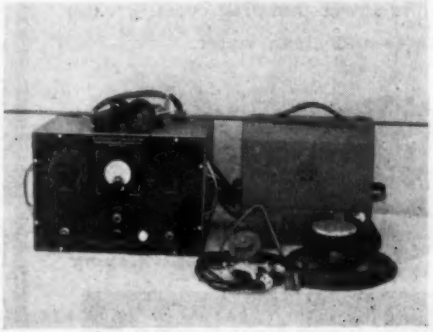
M-SCOPE

Pipe Finder

Leak Survey Equipment

Leak Detector





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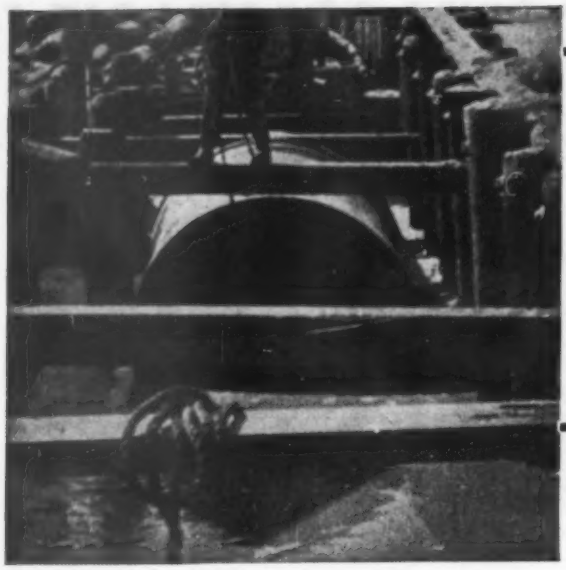

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Large stock enables us to make prompt shipments.

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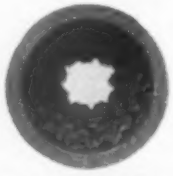
GUARANTEED TO RESTORE 95% ORIGINAL CAPACITY

SAVE For VICTORY

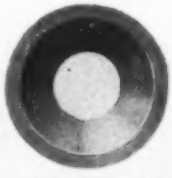
★ ★ ★

EVERYWHERE Americans are being asked to "SAVE FOR VICTORY." Water works superintendents, engineers and public officials can do more in this connection by investigating the National Method of water main cleaning. This method restores the carrying capacity of pipe to at least 95 per cent of that of new mains, thereby eliminating the necessity for purchase of new mains. Aside from this the National Method makes possible lower pumping costs, greater delivery, reduced insurance rates and clean water.



Before Cleaning

The NATIONAL METHOD



After Cleaning

The National Water Main Cleaning Co.

30 Church St. Branches: New York 7

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1221 Mortgage-Guarantee Bldg., Atlanta 3, Ga.
7103 Dale Ave., St. Louis 17, Mo.
3707 Madison St., Kansas City 2, Mo.
3812 Castellar St., Omaha 5, Neb.
P. O. Box 683, Jacksonville 1, Fla.
205 West Wacker Dr., Chicago 6, Ill.
501 Howard St., San Francisco, Calif.
2028 Union Ave., Montreal, Can.
576 Wall St., Winnipeg, Can.

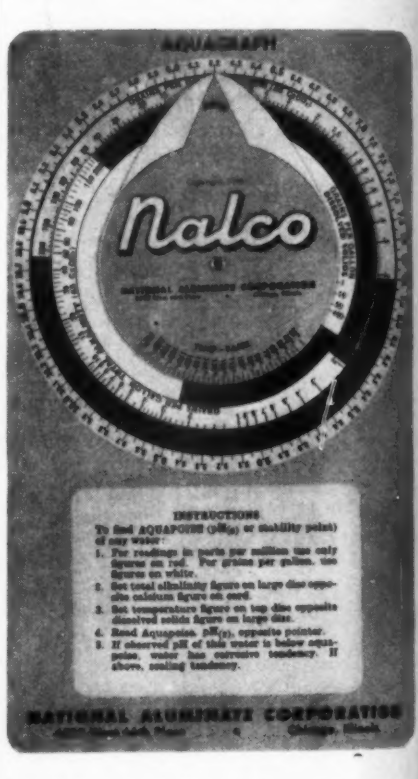
bearing oil level falls, air is admitted into the reservoir through a vent, thus automatically and unfailingly furnishing just enough oil to restore the original oil level.

The indicator consists of two simple parts, the base has a bottom and a side outlet, either of which can be connected to the bearing. The reservoir is sealed to a collar with cement which is impervious to oil, water, acid, or heat. This new General Purpose Constant Level Lubricator (Style B) is a companion to the well known Heavy Duty Oiler (Style J) of the Oil-Rite Corp., 3498 S. 13th St., Milwaukee 7, Wis.

Nalco's Aquagraph

For some time now, there has been available, a unique instrument by which it is possible to determine easily the corrosive or scaling tendency of a water, if the alkalinity, pH, dissolved solids, and temperature are known. This handy device is the **Aquagraph** of the National Aluminate Corp.

Made of high grade coated paper stock, the instrument, which has two

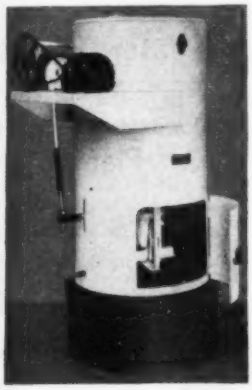


revolving dials superimposed on two circular scales, is used to indicate the *Aquapoise* or pH of the stability point of the water in question; that is, to indicate whether the water is scale forming, balanced, or corrosive in nature.

Directions on the card, which may be used for analyses either in ppm. or gpg., show how the Aquapoise may

do your plans call for a volumetric feeder?

Specify AN OMEGA UNIVERSAL



These rugged, dependable volumetric feeders will feed:

Alum	Lime
Ferrisul	Soda Ash
Ferrifloc	Carbon
Ferrous Sulphate	Clay, etc.

Dissolving chambers of proper capacity are furnished for rate of feed specified.

Other OMEGA Products

Gravimetric Feeders
Solution Feeders
Lime Slaking Equipment
Mechanical Agitators
Bucket Elevators
Laboratory Stirrers

Write for descriptive bulletins.

Sincerely
OMEGA MACHINE CO.
(Division of Builders Iron Foundry)
9N CODDING ST., PROVIDENCE 1, R. I.

be determined by proper setting of the dials. If the observed pH of the water is below that shown on the scale, the water is corrosive. If the observed pH is above the Aquapoise shown on the scale, the water has scaling tendencies.

By the use of this instrument it is possible to determine the type of corrective treatment and a chart of curves will show the amount of corrective treatment required. Persons desiring one of these instruments should write to the National Aluminate Corp., 6222 W. 66th Place, Chicago, Ill.

Bowman Directs Pub. Relations for Carborundum

Within recent weeks Arthur Batts, Pres. of Carborundum, has announced that Francis D. Bowman, long-time advertising manager for the company, has been appointed director of public relations for the company. If you have ever heard Mr. Bowman discourse on the subject of the Indians of Western New York or about the lore of Niagara Falls, you will know that he brings to his new work a personality admirably suited for the job.

Proportioneers' Diatomaceous Filter

%Proportioneers% takes its employees to the movies, but it was no horse opera that they saw at a recent meeting held by the company in Providence. Color pictures were shown of the company's new Diatomaceous Earth Filter in operation. The film, which we too have seen, demonstrates the simplicity and effectiveness of the filter under operation conditions, in which water is taken from a stagnant pond and passed through a Pur-O-Pumper and then through the filter to produce a clear (limpid the poet calls it), potable water quickly and in large quantities. Present at the showing were representatives of the U. S. Navy with whose cooperation the filter was developed.

In a picture taken of the group attending the showing one can recognize Rudy Lowe, Herb Holberg, Charlie Richardson, Henry Armbrust, Walter Shea, and Jim Cook, all faces seen frequently at water works and sewerage meetings.

1879
ROSS
AUTOMATIC VALVES

ALTITUDE VALVES • SURGE • RELIEF • BACK PRESSURE VALVES

FLOAT VALVES • REDUCING AND REGULATING VALVES

ALTITUDE VALVES
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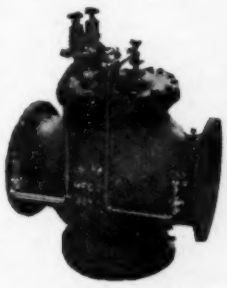
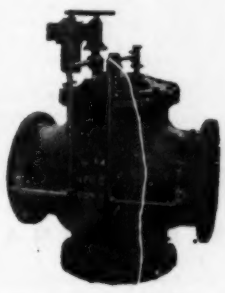
Control of elevation and heads into and out of tanks, basins and reservoirs.
1. Single acting.
2. Double acting.
3. Combination assembly for three or more automatic operations.



COMBINATION VALVE
Combination automatic control both directions through the valve.
A self-contained unit, with three or more automatic controls.



REMOTE CONTROL VALVE
Electric remote control—solenoid or motor can be furnished.
Adapted for use as primary or secondary control on any of the hydraulically controlled or operated valves.

"Blueprint Now!"

ROSS VALVE MFG. CO.
INCORPORATED
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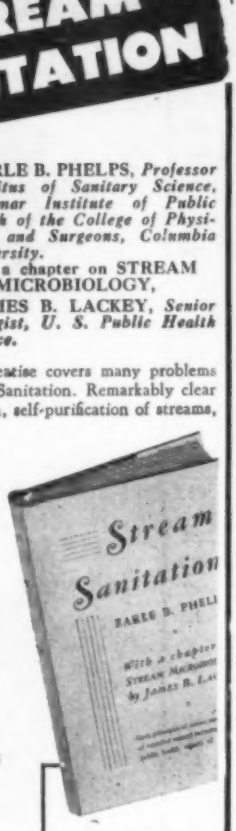
FIRST IMPORTANT BOOK-LENGTH STUDY of STREAM SANITATION

By EARLE B. PHELPS, *Professor Emeritus of Sanitary Science, DeLamar Institute of Public Health of the College of Physicians and Surgeons, Columbia University.*
With a chapter on STREAM MICROBIOLOGY,
by JAMES B. LACKEY, *Senior Biologist, U. S. Public Health Service.*

This comprehensive treatise covers many problems and phases of Stream Sanitation. Remarkably clear discussions on pollution, self-purification of streams, remedial control measures, and associated practices of water and sewage treatment.

This book is extremely important to civil and sanitary engineers, conservationists and directors of industrial research. The chapter on stream microbiology is a subject which is little dealt with in other reference books. It supplies information of great value to waterworks and sewage works officials.



THOROUGH AND AUTHORITATIVE

The author is one of the country's leading authorities on stream sanitation. His valuable researches and wide experience have won him an enviable reputation among scientists and technical men alike. In addition to his vast knowledge of the scientific approach to stream sanitation, Mr. Phelps posseases a remarkable ability to explain a difficult subject clearly.

CONTENTS

- The Life History of a Stream
- Biology of Growth and Decay
- Aerobic Decomposition. Oxidation
- Anaerobic Decomposition. Digestion
- The Oxygen Balance
- Public Health Aspects. Bacterial Pollution
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- Index

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Philadelphia Quartz Has New Service Emblem

Recognizing the long years of continuous service of the men and women at the Philadelphia Quartz Company, Philadelphia, Pa., manufacturers of silicates of soda, Thomas W. Elkinton, Pres., recently announced a new service emblem plan.

All employees associated with the company for 10 years or over will receive buttons designating specific periods of service. The emblem is patterned from the company initials, P.Q., the Q forming the outside border. The emblem for 10-year employees are silver, and gold emblems are used for each succeeding five-year period. For 25, 30, 35 and 40 years, jewels are added. Top honors were bestowed on John A. Wilson, Construction Superintendent, for his record of 42 years. Fifty-five employees have been with the company for over 25 years.

All departments of the company, its offices, laboratory, and nine plants, are eligible for the emblem. Records of 15 years or longer have been achieved by 36 per cent of the plant employees and 34 per cent at the offices.

Changes at Crane

Effective Jan. 1st, Crane Co. of Chicago has announced several changes in the management of its branch offices. In Los Angeles D. D. Updegraff has resigned on advice of his physician to regain his health, and has been succeeded by R. E. Penny, manager of the Jacksonville Branch since 1941. L. R. Bauer, manager at Brooklyn and New Haven, goes to Jacksonville and is replaced by J. J. Murray, recently planning department analyst at Chicago.

In Memphis, Tenn., F. A. Duncan, manager since 1922, has retired after 43 years of service. He is succeeded by O. F. Woodyard, former manager at Little Rock, Ark., who, in turn, is followed by A. C. Gribble, formerly a salesman in the Houston branch.

Recent Production Awards

Most recent production awards that we have heard about are the third Army-Navy "E" to the Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Passaic, N. J.; the second "E" to Aurora Pump Co., Aurora, Ill.; and the Maritime "M" award to the Electric Machinery Mfg. Co. of Minneapolis, Minn.

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FIRE HYDRANTS AND VALVES
WATER WORKS EQUIPMENT

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For
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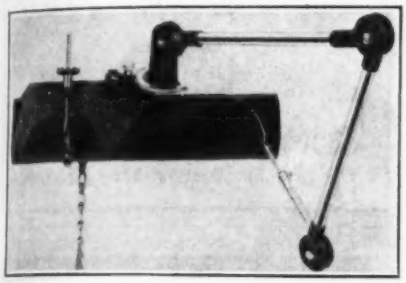
VALVE COMPANY
WATERFORD, N.Y.

Seep-Seal for Leaks in Concrete

A new material to stop water leaks in concrete has recently appeared on the market. If it is as good as the advertisers claim, then all of your worries over damp walls or leaks are over. Prepared by the Rock-Tred Corp. and sold under the name of Seep-Seal, the material has several applications in the stopping of leaks, even, when mixed with cement, to stopping a flow of water through cracks. The applications of the new material are described in a bulletin which may be obtained from Rock-Tred Corp., 629 W. Washington Square, Chicago 6, Ill.

Tru-Mark Protractor

Pipe, structural shapes, and flat sheets are quickly and accurately scribed for cutting on any angle to ½ degree with the Trumark Protractor. The model illustrated scribes

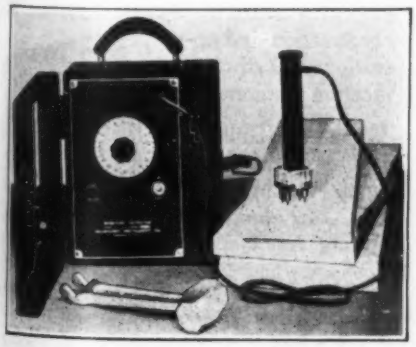


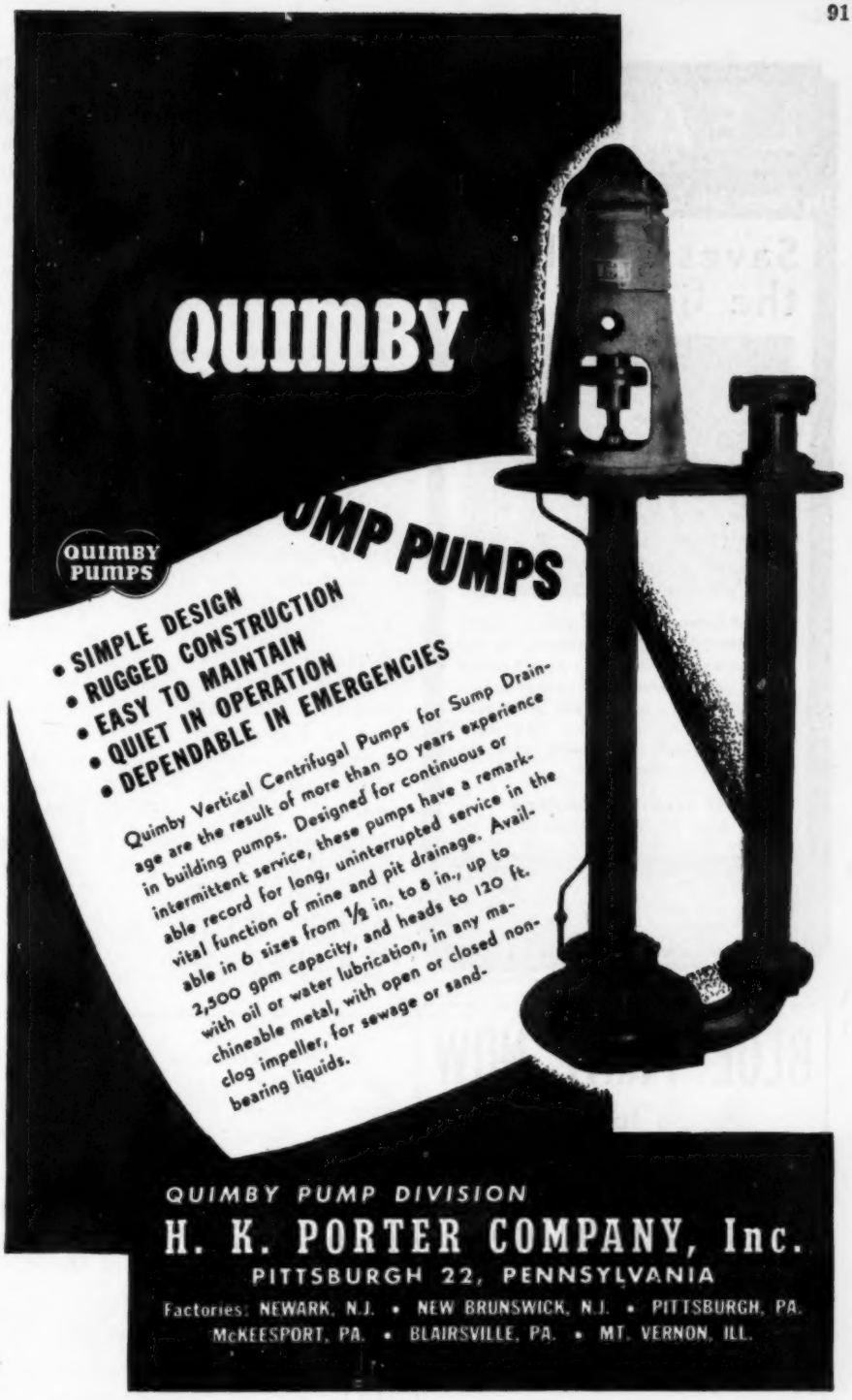
pipe 3 to 18 inches in diameter. A smaller model will take pipe from ½ to 3 inches. Special sizes furnished on order to Tru-Line Corp., 759 Venice Blvd., Los Angeles 15, Cal.

Delmhorst Moisture Detector

With a new piece of equipment only 7x4x8¾ in. it is possible to measure, within 1 per cent, the moisture content of lumber and wood products, plaster, masonry and other materials. This is the Delmhorst Moisture Detector manufactured by the Colloid Equipment Co., 50 Church St., New York 7, N. Y.

Bulletin 105 describes the unit, its construction, its operation, and its uses. Rugged and portable, the principle of operations depends on the conductivity as measured by the insertion of fine electrodes into the surface of the item being studied. Moisture contents between 7 and 25 per cent are easily determined.

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QUIMBY PUMPS
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• RUGGED CONSTRUCTION
• EASY TO MAINTAIN
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• DEPENDABLE IN EMERGENCIES
Quimby Vertical Centrifugal Pumps for Sump Drainage are the result of more than 50 years experience in building pumps. Designed for continuous or intermittent service, these pumps have a remarkable record for long, uninterrupted service in the vital function of mine and pit drainage. Available in 6 sizes from 1½ in. to 8 in., up to 2,500 gpm capacity, and heads to 120 ft. with oil or water lubrication, in any machineable metal, with open or closed non-clog impeller, for sewage or sand-bearing liquids.
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Duracite Alkali-and-Acid-Resistant Cement

Something new in acid and alkali resistant cements has been announced by the U. S. Stoneware Co. This new Furane-base resin cement is resistant at temperatures up to 375° F to most inorganic acids in practically all strengths except nitric, chromic, aqua regia, pure bromide, and sodium chlorite in acid solutions. It is also resistant to alkalies of any concentration, oils, and solvents. Characterized by extreme density, high compressive and tensile strengths, it can be used for acid-proof masonry in tank linings, floors, sewers, towers or other installations handling alternately acids or alkalies.

Duracite comes in the form of a liquid and a powder and, unlike synthetic cements of the phenolic type, can be stored indefinitely before mixing without deterioration. This new cement has an extremely low porosity and an absorption of less than ½ per cent.

LEADITE

The Pioneer Self-Caulking Material for C. I. Pipe

Saves all along the line . . . . .

. . . Engineers and water works operators have been proving it for more than 40 years . . . that *Leadite* saves in material and construction costs, *makes a good tight joint that improves with age* . . . and when the line is laid with Leadite they can forget it with confidence.

THE LEADITE COMPANY
Girard Trust Co. Bldg., Philadelphia, Pa.

No Caulking

BLUE PRINT NOW
for
SEWAGE TREATMENT PLANTS
and
WATER TREATMENT PLANTS

★ ★ ★

Send for Aero-filter Bulletin 112 for Sewage Plants.

Low initial cost.

Low operating cost.

Send for Water Treatment Bulletin 36.

LAKESIDE ENGINEERING CORPORATION

222 W. Adams St. Chicago 6, Ill.

Although the cement appears to have wide application in industrial plants, and water and sewage plants using ferric chloride or other coagulant, it should be pointed out that it requires special consideration or actual test under specific conditions before it may be fully accepted as satisfactory for bleach solutions, bromine water, chlorine water, hypochlorite solutions or peroxide solutions.

Brush Type Wire Stripper

Ideal Commutator Dresser Co., of 1615 Park Ave., Sycamore, Ill., has announced a new and inexpensive wire stripper for cleaning cotton and enamel, silk and enamel, string asbestos, and similar types of light insulation from wire, whether round or flat or rectangular. Two wire cleaning brushes are positively driven by separate motors and dust, strippings, etc., are removed by a dust collector driven by a separate motor. A foot pedal controls the operation of the equipment.

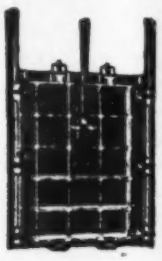
LITERATURE AND CATALOGS

Six hundred tons of wrought iron in a sewage plant—that's a lot of wrought iron, but there it is in Chicago's North Side Sewage Treatment Works, according to a technical bulletin, **"Wrought Iron for Sewage Treatment and Disposal Installation,"** prepared by the Engineering Service Dept. of the A. M. Byers Co., Pittsburgh, Pa.

With pictures from Minneapolis, St. Paul, Waterloo, Dallas, New York City, Milwaukee, Washington, D. C., Cleveland, and elsewhere for illustration of the points made, this bulletin shows wrought iron used in digesters, air lines, screens, gas lines, sewer outfalls, manhole ladder steps, distributor arms, sludge cars, vent stacks, weir plates, stirring mechanisms, and so on, and so forth, to the number of more than fifty.

And speaking of Technical Bulletins from A. M. Byers, there is another one, **"Wrought Iron for Underground Services,"** which has some interesting information on factors influencing soil corrosion. Soil types, galvanic and electrolytic effects, bacterial action, protective coatings, and soil corrosion tests all come in for a bit of discussion.

RODNEY HUNT



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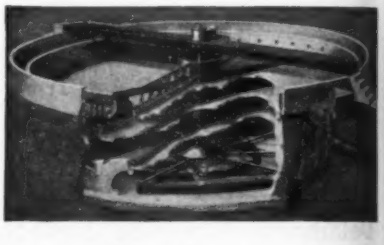
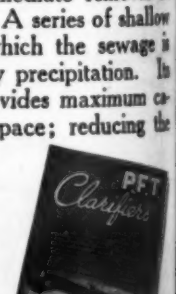


P.F.T. Clarifiers for Rapid Precipitation of Sewage Solids

The P.F.T. Tray Clarifier embodies a design which affects the continuous rapid separation of the solids and liquid in sewage; and the immediate removal of the clarified effluent. A series of shallow settling areas over which the sewage is spread assures speedy precipitation. Its high rate of flow provides maximum capacity in minimum space; reducing the construction and operating costs of clarification equipment.



Write for Bulletin No. 210 containing complete information, including operating results.

P.F.T. Pacific Flush-Tank Company
4241 Ravenswood Ave., Chicago, Ill.
New York Charlotte, N. C

In order to correlate the theory with actual experience data, the principal emphasis of the book has been placed on records of underground pipe installations of wrought iron in various applications as water, oil and gas lines.

Cure and Prevention via the Tate Process—

Why stand for *This?* When you can have *THIS! THIS* being a water pipe all clogged and fouled with rust and growths, and *THIS* being a clean water main, lined with concrete the Tate Process way. Thus the theme of a small four-page folder from Tate Pipe Linings, Inc., of Andover, Mass. In eight simple statements the folder tells what the Tate Process means to the water superintendent or any one else who has endured the headaches of reduced water flow in mains clogged with tubercles and bacterial growths. "The Cure and Prevention of the effects of corrosion in pipe lines by the Tate Process Used the World Over" is the catch phrase beside the diagrammatic sketch of how it is done. It's done by cement lining in place, in case you didn't know.

Are you a water technologist? Do you want to produce a pure water of exacting specifications in flows of from 0.1 to 40.0 mgd.? Do you want to know how it is being done in 25 plants throughout the country? If so, write the Dorr Co., 570 Lexington Ave., New York 22, N. Y., for a copy of **Bulletin 9041** describing the Dorrco "Hydro-Treator."

This 24-page bulletin, containing several pages of data tables and useful information, explains how the Hydro-Treator is a self-contained water treatment unit which combines three steps, flocculation, thickening, and clarification, in one unit.

The book not only describes the action of the unit, but also gives sizes, types, fields of application, advantages, capacity ratings, operating results, and sample specifications.

Do you remember way back when you first saw the letters **P.D.Q.** in a little newspaper adv. down in the corner of page twelve of the local "Comical Noise"? And do you remember that underneath it said, "Pesky Devils Quietus" and showed a dead cockroach? Maybe it still means that, but **P.D.Q.** also now stands for Porter, Devine and

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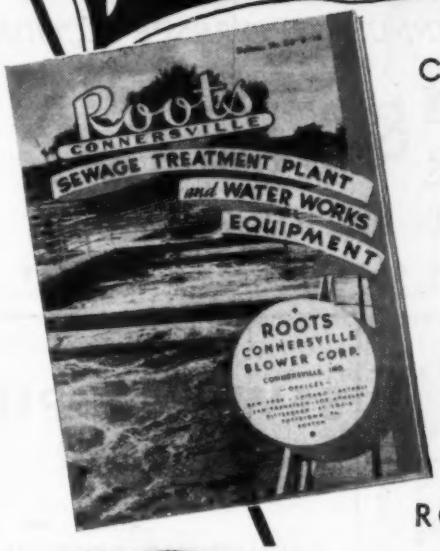

It gives much interesting and helpful information on positive displacement and centrifugal aerating blowers, positive displacement digester gas meters and filter vacuum pumps. The vital part played by air in sewage treatment is explained, together with the advantages of various types, drives, etc. Typical "R-C" installations are also shown. We have a copy of Bulletin 23-B-12 for you.

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Rotary Positive & Centrifugal AIR and GAS HANDLING EQUIPMENT

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Some of the reasons for this preference are given in our Bulletin W. May we send it to you?

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SEE DATA PAGE IN ANNUAL REFERENCE SECTION

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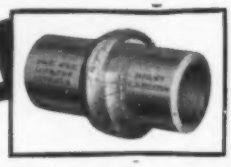

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Quimby, "the complete line of Better Built Equipment for the process industries" of H. K. Porter Co., Inc., of Pittsburgh. A recent bulletin "P.D.Q." is the first combined catalog bulletin since the merging of these three organizations under the Porter banner. From agitators and autoclaves through industrial locomotives to pumps of all kinds, the catalog shows all of the equipment available from H. K. Porter Co., whose home office is Pittsburgh 22, Pa.

"Oceans of Water." So goes the title of the first article in the Nov.-Dec. issue of the Fairbanks-Morse News. Tells how Pomona-Westco offers its own heritage as an added chapter to the Fairbanks-Morse story. There are a couple of other items in this issue also about water. One on "Noquochoke Water" at Falls River, Mass., and the other about gravel filter wells as developed by Cranston of Fredonia, N. Y. There is also an item of interest on Z-Power for Crab Skiffs. Ever hear of the Cajan crab fisherman on the lakes and bayous in Louisiana? Cajans (we spelled it Cajin or Cajun when we were in Texas), in case you didn't know, are the descendents of the Arcadians, made immortal in Longfellow's Evangeline. Interesting people . . . Interesting too that modern equipment has now reached the more primitive fishing methods. But F.-M. seems to be bent on putting their equipment everywhere.

Not long ago we ran an announcement about Guy Northrup's new **"Bondo"** sulphur cement as a jointing compound for cast iron water mains. Now we can tell you about his new catalog; twelve pages devoted to instructions for using Bondo; and testing water mains jointed with Bondo; along

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with wood burning, oil burning, and gasoline furnaces; other Bondo equipment such as braided jute, joint runners, ladles, scoops, pouring funnels, joint cutters, and so forth. Tables on wall thickness and weights of centrifugally cast pipe and reference tables on amounts of Bondo required per joint and per 1,000 ft. of pipe are also included. Northrup and Co., Inc., office is located at 50 Church St., New York 7, N. Y.; works at Spring Valley, N. Y.

The Auto-skimmer and Autoflusher as manufactured by Yeomans Bros. is in operation at Western State Hospital, Hopkinsville, Ky., according to a story in the Nov.-Dec. issue of the **"Yeomans Guard."** This is the issue that captions its lead story, "No! Mr. Zimmerman, the guarantee does not last 42 years! . . . But Yeomans Pumps Do." It's an interesting story of two Yeomans centrifugal pit ejectors, one of which was needing service for the first time in 42 years. It's the kind of a story even a busy man will stop to read in a manufacturers' house organ. You may obtain it from Yeomans Brothers Co., Chicago, Ill.

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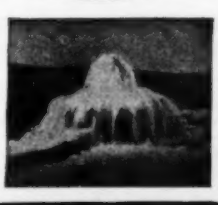

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Single Acting
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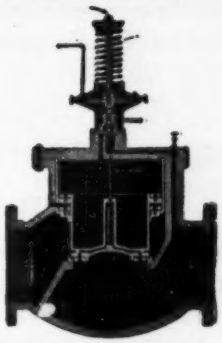

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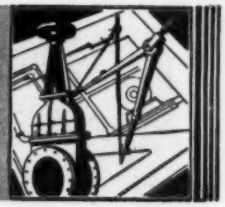

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*Advertisers with * were represented in the June, 1944, Convention and Data Edition with catalog specification copy. Please refer to that issue for additional information on behalf of their products.

Dorrco Doings in 1944

'44 is ending with "When" still indefinite. Technology plus the courage and bravery of free peoples fighting for their homes have been the deciding factors.

The postwar world from all viewpoints—political, social, and economic—must be considered only as a whole.

The recent campaign has shown that America realizes at last, world solidarity means civilization's survival.

Whatever the basis—and it's obvious that methods are legion—one thing stands out above all: We must plan for a worldwide freedom to grow.

The M.R.A. is doing work of great significance especially in industrial relations. I saw a play "The Forgotten Factor" recently put on by them, the thesis of which was that disharmony at home becomes trouble industrially and nationally and finally internationally. One phrase stuck with me: Not "who's right", but "what's right." It is impossible to say how far we could go if we could work on that line alone.

I'm afraid we're all too inclined to want to change the other fellow instead of ourselves. I came away in a very humble frame of mind which stays with me. They may have the answer to a lot of our trouble.

The book of Russell Davenport's called "My Country" made me even more humble. Here is a poet saying things to make you stop and think. Here is a picture of our country's ideals which should move all of us. Let me give you a few of its many quotable lines.

"The Embattled Destination of the free
Not peace, not rest, not pleasure
But to dare to face the axiom of democracy.
Freedom is not to limit but to share
And freedom here is freedom everywhere."

PLANT ENGINEERING

Engineering, like research, covers many things. The last few years have brought us to the place where in our widening fields we are connected with industrial work almost from the prospector's pick (or the wild-eyed inventor's "flash of genius", as Mr. Thurman Arnold would say) to the first dividend.

All steps fit together. Among work now in execution is a plant for recovering Al_2O_3 from aluminous cement material and one to make fertilizer using waste explosives acids. Both come from the need to utilize Dorr specialized knowhow.

SANITARY

Post war planning progresses. "BLUE PRINT NOW" is becoming an accomplished fact.

In emergency cases like that of Kansas City, Kan., priorities granted allowed starting a gigantic new water plant to be fully Dorr equipped.

Development work from fundamental investigation to equipment improvement has continued. Coming into sight after long testing periods are thermophyllic digestion to cut digestor space in half and dual clarification applicable to high rate filter plants, while our Vacuator reaching from synthetic rubber to Sewage is developing as a scum and grit remover unit.

INDUSTRIAL WASTE TREATMENT

A large plant for the treatment of sweet potato starch waste in Florida is completely Dorr equipped and should soon go into operation. This plant being built by the U. S. Sugar Company demonstrates that progressive industries are ready and willing to bear their share of the general plan for stream improvement. It combines the advantageous features of pre-digesting the strong waste followed by high rate trickling filter treatment.

D-I SYSTEM

Having devoted three years to pioneer work on the treatment of chemical solutions by De-ionization, we applied our knowledge to the field of water treatment. Attractive laboratory units and compact self-contained commercial plants have been developed. Our work in the larger plant field has demonstrated the value of stage regeneration first demonstrated by us on sugar.

METALLURGICAL

One new tool added to complete our ore dressing equipment for "Separations" is the Dorrco Sizer under test for some time but now demonstrated on Iron and other ores.

It, in combination with other equipment, is adding to the recovery of fine ore with an overall simplicity of operation that guarantees wide use.

From 4 microns up to 1" mesh, Dorr methods and engineering have solved many problems; with single machines classifying 15,000 tons of material per day down to Sizers treating only a few pounds of abrasives per hour.

Our work at Westport including the new semi-works plant, backed by many long-continuing field tests, has helped much in giving the "authority" back of all our services.

PULP AND PAPER

All who have filled out questionnaires understand the paper shortage and why it is bringing great demand for recausticizing.

The pioneers in continuous causticizing work during World War One, we have restudied this subject in the light of new tools available, and our new installations will show a great advance in overall operational efficiency over those of earlier times.

In other words the old Edisonian motto, "The best can always be improved" still holds.

FLUOSOLIDS

Our development work on this new tool borrowed from the petroleum industry is progressing along several different lines. We are now in pilot plant phases and believe the results will be useful to the chemical and metallurgical industries. In general we have promise of a means for promoting gaseous-solids surface reactions with close temperature control and large capacity.

SUGAR

Twenty-five years ago, the Dorr Cane Juice Clarifier revolutionized raw-sugar manufacture by successfully clarifying cane juices continuously. The many intervening years of manufacturing operations and the opportunity for world-wide observations under the most varying conditions, together with continuous study from the physicist's viewpoint, have resulted in many improvements over the first Dorr Clarifier. These increased both its tonnage capacity for clarifying juice and its ability to produce heavy muds needed for filtering—both of which are vital factors in meeting the peculiar difficulties that were brought to sugar houses when seedling canes were introduced.

SEMI-WORKS PLANT

Completing our original program of '36 at Westport, we started handling materials in May. Designed for great flexibility, it provides for product-grinding, separations, dissolution and filtration on a tonnage scale giving products for commercial demonstration and data for plant design. It includes also a full size magnetic separator.

The variety of work brought here has been from dolomite separation to a refractory magnesia and a carbonate filler, to the stabilization treatment of apple juice.

Our staff's engineering work in the design and layout of this building has given us more facilities and yet preserved the inherent beauty of our surroundings.

A technical museum in our "attic" tells the story of Dorr Developments.

ABROAD

As the Axis shrinks we hear from Dorr Engineers in liberated areas. One in Europe hung a homemade American flag a few minutes too soon and lost a window pane thereby.

Our preparations for renewed world coverage include an organization that recognizes the new global concept, and we expect to work with our friends everywhere, sharing our experience and that of our associates here. As one well travelled engineer said to me, "You can get men and machinery to sell, but you cannot buy or manufacture thirty years of character and experience".

As larger and larger areas are becoming liberated from Axis domination, we are making contact again with increasing numbers of our friends and former representatives abroad. We welcome these renewed associations. Along with our New Year's Greetings, goes the hope that 1945, as a year of victory, will usher in the removal of all war-imposed barriers to world trade.

John V. N. Dorr

570 Lexington Avenue,
New York 22, N. Y.

DORRCO

7719

Will these new facts about FREE CHLORINE RESIDUALS make "Presumptives" rare as "Positives"?

Positive confirmation of coliform bacteria is now a rarity at plants where chlorination is continuously used. The persistence of gasformers, however, has been the bane of sanitary engineers to whom a bacteria-free water is the ultimate ideal.

Their "passion for perfection" has brought new facts to light. These facts establish that *free available chlorine residuals* — and only such residuals — can assure the destruction of all gasformers. (1) (2). They also indicate test procedures that distinguish between free available chlorine residuals and those in which chloramines are a factor. (3) (4) (Details of the preferred procedure in your area can be supplied.)

Application of Break-point chlorination in the light of these new findings is now serving to make "presumptives" as rare as "positives". Yet problems of overchlorination are avoided, and reductions in the taste and odor of the finished water are frequently secured.

In fulfilling your post-war responsibility for a safer, more palatable water, these facts will be of decided interest. Your Wallace & Tiernan Representative can furnish them.

1. Cox — Jl. A.W.W.A., 31:1489. (1939)
2. Streeter — Jl. A.W.W.A., 35:421. (1943)
3. Laux, Nickel — Jl. A.W.W.A., 34:1785. (1942)
4. Hallinan — Jl. A.W.W.A., 36:396. (1944)

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